

From forrerj@ucs.orst.edu Fri Dec 01 00:33:27 1995  
Received: from ucs.orst.edu (root@UCS.ORST.EDU [128.193.4.5]) by sys1.tapir.org  
(8.7.2/8.7.2) with SMTP id AAA10285 for <hfsig@tapir.org>; Fri, 1 Dec 1995 00:33:24  
-0600 (CST)  
Received: from p08.t0.monrotel.com by ucs.orst.edu;  
(5.65v3.0/1.1.8.2/24Sep94-1201PM)  
id AA05633; Thu, 30 Nov 1995 22:33:10 -0800  
Message-Id: <9512010633.AA05633@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Thu, 30 Nov 1995 22:35:58 -0800  
To: hfsig@tapir.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: Re: [HFSIG:726] Loading problems with EVM56

Tom,

>From what you describe it sounds like you have your COM port for the EVM not  
set up right. Most PC's really only have two com port IRQ's (3 and 5), where  
COM1/3 share IRQ 3 and COM2/4 share IRQ 5. If you connected your EVM to COM3  
for instance and then have your mouse connected to COM1, then the debugger  
will grab IRQ 3 and use it. So when the OnCe port talks to the PC, not only  
does the debugger receive those interrupts, but the mouse's device driver  
will also receive those interrupts - its the mouse driver that eventually  
choke on that data. So - if you can check that to make sure. You need a  
dedicated COM port with its own free IRQ. I know that is a scarce resource.

Hope that helps. Hope to be doing some tests with you in the near future.

--Johan

>Hello All -

>

>I have completed the building of the interface circuit for the EVM56. I  
believe I

>am having trouble in my prodcedures to load the code needed to run the  
multi-tone

>modem. I first load BIOS.CLD via the debugger, and then try to load the modem  
>software. At that time, the debugger crashes and locks up the entire PC  
forcing me

>to reset the PC and start over again. What am I doing wrong????? Please  
help!!!

>

>73 de Tom, N9GUN

>tomob@ix.netcom.com

>

>

>

From dwborden@ns1.pananet.com Fri Dec 01 05:25:44 1995  
Received: from ns1.pananet.com ([206.33.152.3]) by sys1.tappr.org (8.7.2/8.7.2)  
with SMTP id FAA18518 for <hfsig@tappr.org>; Fri, 1 Dec 1995 05:25:35 -0600 (CST)  
Received: from TARDIS by ns1.pananet.com (NTMail 3.00.06) id aa000260 Fri, 1 Dec  
95 11:25:08 -0400 (EDT)  
Message-ID: <30BEE53E.210C@pananet.com>  
Date: Fri, 01 Dec 1995 06:21:34 -0500  
From: David Wilson Borden <dwborden@ns1.pananet.com>  
X-Mailer: Mozilla 2.0b2 (Windows; I; 32bit)  
MIME-Version: 1.0  
To: hfsig@tappr.org  
Subject: Re: [HFSIG:728] Re: Loading problems with EVM56  
References: <9512010633.AA05633@ucs.orst.edu>  
Content-Type: text/plain; charset=us-ascii  
Content-Transfer-Encoding: 7bit

John,

I am trying to buy an EVM56 and join you people. I am going through Newark Electronics. I am down here in Panama, but that should not matter, I have the U.S. Mail through a military base, so it should eventually work.

As a member of AMRAD, we build 56001 boards several years ago, but we never made them in quantity and we wire wrapped them, so I am looking to move to something more standard, and the EVM56 seems cheapest.

On your interrupts, although for your discussion it does not matter, since you are talking about conflicts:

INT 0 = System Timer

INT 1 = Keyboard

INT 2 = System

INT 3 = COM2 (Usually modem or I use to load my 56001 board)

INT 4 = COM1 (Usually mouse as you point out)

INT 5 = Free (I use for ethernet card to talk to other PCs)

INT 6 = Disk Controller

INT 7 = Free (I use for sound card like SoundBlaster)

Looking forward to getting the board and trying out all this neat new software.....David, K8MM0/HP2

From jalocha@home.ifj.edu.pl Fri Dec 01 07:02:12 1995  
Received: from home-gate.ifj.edu.pl (home-gate.ifj.edu.pl [192.86.14.17]) by sys1.tappr.org (8.7.2/8.7.2) with SMTP id HAA20825 for <hfsig@tappr.org>; Fri, 1 Dec 1995 07:02:00 -0600 (CST)  
Received: from home.ifj.edu.pl by home-gate.ifj.edu.pl (JNOS1.101) with SMTP id AA4158 ; Fri, 01 Dec 95 13:01:47 UTC  
Date: Fri, 1 Dec 95 13:52:22 MET  
From: "Pawel Jalocha" <jalocha@home.ifj.edu.pl>  
Message-ID: <1262.jalocha@home.ifj.edu.pl>  
To: hfsig@tappr.org, dsp4@nic.funet.fi  
Reply-to: jalocha@home-gate.ifj.edu.pl  
Subject: 1200 bps BPSK modem works !

I got a confirmation from an "independent source", Pauli Jeskanen, that my 1200 bps modem works well in his "real" satellite setup.

At least on receiving but he is going to try transmissions as well.  
If that works we have got a satellite modem on the DSPCARD4 and EVM56K !

For the 400 bps modem for the telemetry, I have to find out the details about the data encoding and try again. My naive assumption that it's just like the 1200 bps downlinks did not work :-)

Still you can use this modem for HF...  
Actually I could scale it to some very low bit rate (10 bps ?)  
for (super) narrow band experiments.

Pawel

From mcdermot@rdxsunhost.aud.alcatel.com Fri Dec 01 07:33:25 1995  
Received: from aud.alcatel.com (rockdal.aud.alcatel.com [128.251.30.1]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id HAA21931 for <hfsig@tapir.org>; Fri, 1 Dec 1995 07:33:21 -0600 (CST)  
Received: from rdxsunhost.aud.alcatel.com.Aud.Alcatel.COM by aud.alcatel.com (4.1/SMI-4.1)  
id AA29614; Fri, 1 Dec 95 07:32:48 CST  
Received: from eagle.aud.alcatel.com by rdxsunhost.aud.alcatel.com.Aud.Alcatel.COM (4.1/SMI-4.1)  
id AA05295; Fri, 1 Dec 95 07:32:47 CST  
Received: by eagle.aud.alcatel.com (4.1/SMI-4.1)  
id AA01784; Fri, 1 Dec 95 07:32:45 CST  
Date: Fri, 1 Dec 95 07:32:45 CST  
From: mcdermot@rdxsunhost.aud.alcatel.com (Tom Mcdermott)  
Message-Id: <9512011332.AA01784@eagle.aud.alcatel.com>  
To: hfsig@tapir.org  
Subject: Negative Frequencies  
Cc: mcdermot@rockdal.aud.alcatel.com

Danie: I think the email I sent you previously on negative frequencies was not so clear. I had in my mind some FFT frequency wrapping effects, and not purely the subject of negative frequencies, for some reason.

I have reread John Bloom (KE3Z) article in Sept 94 QEX, and it is very clear. You should read this, as I think it will explain better what I think your question was.

To be concise: if you have a signal, then to get rid of it's negative part, you must have the I- and Q- components. In analog you use a 90-degree wideband phase shifter (or plus 45 and minus 45-degree shifters). In the digital world, you can use a Hilbert transform to generate 90-degree phase shift. You end up with two quadrature signals, the I- and Q- components, which unambiguously defines the positive (or negative, with a sign change) frequency parts.

I hope this is a better answer, if not please let me know.

- Tom

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-----+-----
Tom McDermott                | "All opinions expressed
Alcatel Network Systems, Inc. | are my own, and do not
mcdermot@aud.alcatel.com     | represent those of Alcatel
[ ICC'96 Technical Program Secretary ] | Network Systems, Inc."
[ June 23-27, 1996, Dallas, Tx. ] |
-----+-----
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From JALOCHA@chopin.ifj.edu.pl Fri Dec 01 08:46:02 1995  
Received: from nms.cyf-kr.edu.pl (nms.cyf-kr.edu.pl [149.156.1.3]) by  
sys1.tapir.org (8.7.2/8.7.2) with SMTP id IAA24204 for <hfsig@tapir.org>; Fri, 1 Dec  
1995 08:45:49 -0600 (CST)  
From: JALOCHA@chopin.ifj.edu.pl  
Received: from CHOPIN.IFJ.EDU.PL (chopin.ifj.edu.pl [192.86.14.9]) by nms.cyf-  
kr.edu.pl (8.6.11/8.6.11) with SMTP id PAA25731 for <@NMS.CYF-  
KR.EDU.PL:hfsig@tapir.org>; Fri, 1 Dec 1995 15:47:25 +0100  
Date: Fri, 1 Dec 1995 15:43 GMT+1  
Subject: Re: [HFSIG:726] Loading problems with EVM56  
To: hfsig <@NMS.CYF-KR.EDU.PL:hfsig@tapir.org>  
Message-id: <8C3F4B9FC020951F@chopin.ifj.edu.pl>  
X-Envelope-to: @NMS.CYF-KR.EDU.PL:hfsig@tapir.org  
X-VMS-To: IN%"<@NMS.CYF-KR.EDU.PL:hfsig@tapir.org>"

>I have completed the building of the interface circuit for the EVM56. I believe I  
>am having trouble in my procedures to load the code needed to run the multi-tone  
>modem. I first load BIOS.CLD via the debugger, and then try to load the modem  
>software. At that time, the debugger crashes and locks up the entire PC forcing  
me  
>to reset the PC and start over again. What am I doing wrong????? Please help!!!

Hello Tom, do other applications like FFT-CUT or COREFLT work correctly ?  
Just check maybe you didn't set the EVM56K flag in the NEWQPSK.ASM  
before compiling ? I have no idea why it would crash the PC but...  
If you compiled the source for the DSPCARD4 the only difference  
is in the data memory allocation, thus some blocks of data go into  
different places of the DSP's RAM. Maybe this touches some vital  
locations ? And check if the memory jumper is set to "16K".

Pawel

From alanb@tsnake2.sr.hp.com Fri Dec 01 11:34:57 1995  
Received: from relay.hp.com (relay.hp.com [15.255.152.2]) by sys1.tapir.org  
(8.7.2/8.7.2) with ESMTMP id LAA03362 for <hfsig@tapir.org>; Fri, 1 Dec 1995  
11:34:53 -0600 (CST)  
Received: from srmail.sr.hp.com by relay.hp.com with ESMTMP  
(1.37.109.16/15.5+ECS 3.3) id AA221709273; Fri, 1 Dec 1995 09:34:35 -0800  
Received: from tsnake2.sr.hp.com by srmail.sr.hp.com with ESMTMP  
(1.37.109.16/15.5+ECS 3.3) id AA167149195; Fri, 1 Dec 1995 09:33:16 -0800  
Received: by tsnake2.sr.hp.com  
(1.37.109.16/15.5+ECS 3.3) id AA046749195; Fri, 1 Dec 1995 09:33:15 -0800

From: Alan Bloom <alanb@tsnake2.sr.hp.com>  
Message-Id: <199512011733.AA046749195@tsnake2.sr.hp.com>  
Subject: Re: [HFSIG:727] Re: BPSK modem for 1200 bps  
To: hfsig@tapr.org (Danie Brynard)  
Date: Fri, 1 Dec 1995 09:33:14 -0800 (PST)  
In-Reply-To: <199512010518.HAA19703@f15.pix.za> from "Danie Brynard" at Nov 30, 95 11:31:08 pm  
X-Mailer: ELM [version 2.4 PL21]  
Mime-Version: 1.0  
Content-Type: text/plain; charset=US-ASCII  
Content-Transfer-Encoding: 7bit

>

> Webersat 18 has a 1200bps BPSK (on SSB) AX.25 uplink on 437.075MHz. It uses  
> a Raised Cosine 1200bps BPSK (on SSB) AX.25 downlink on 437.102MHz.

Is it raised cosine or root raised cosine? Generally a root Nyquist filter is used in both receiver and transmitter, so that the total channel response is Nyquist, which gives zero inter-symbol interference (ISI).

Also, you need to know the alpha factor. Transmitter and receiver must use the same alpha factor to avoid ISI.

Alan Bloom N1AL

From alanb@tsnake2.sr.hp.com Fri Dec 01 11:38:20 1995  
Received: from relay.hp.com (relay.hp.com [15.255.152.2]) by sys1.tapr.org (8.7.2/8.7.2) with ESMTP id LAA03430 for <hfsig@tapr.org>; Fri, 1 Dec 1995 11:38:15 -0600 (CST)  
Received: from srmail.sr.hp.com by relay.hp.com with ESMTP (1.37.109.16/15.5+ECS 3.3) id AA229539483; Fri, 1 Dec 1995 09:38:07 -0800  
Received: from tsnake2.sr.hp.com by srmail.sr.hp.com with ESMTP (1.37.109.16/15.5+ECS 3.3) id AA167749477; Fri, 1 Dec 1995 09:37:58 -0800  
Received: by tsnake2.sr.hp.com (1.37.109.16/15.5+ECS 3.3) id AA123619477; Fri, 1 Dec 1995 09:37:57 -0800  
From: Alan Bloom <alanb@tsnake2.sr.hp.com>  
Message-Id: <199512011737.AA123619477@tsnake2.sr.hp.com>  
Subject: Re: [HFSIG:729] Re: Loading problems with EVM56  
To: hfsig@tapr.org (David Wilson Borden)  
Date: Fri, 1 Dec 1995 09:37:57 -0800 (PST)  
In-Reply-To: <30BEE53E.210C@pananet.com> from "David Wilson Borden" at Dec 1, 95 05:30:26 am  
X-Mailer: ELM [version 2.4 PL21]  
Mime-Version: 1.0  
Content-Type: text/plain; charset=US-ASCII  
Content-Transfer-Encoding: 7bit

>

> INT 0 = System Timer  
> INT 1 = Keyboard  
> INT 2 = System  
> INT 3 = COM2 (Usually modem or I use to load my 56001 board)  
> INT 4 = COM1 (Usually mouse as you point out)

> INT 5 = Free (I use for ethernet card to talk to other PCs)  
> INT 6 = Disk Controller  
> INT 7 = Free (I use for sound card like SoundBlaster)

Aren't INT5 and INT7 generally used for parallel printer ports  
LPT2 and LPT1?

Al Bloom N1AL

From danie.brynard@pixie.co.za Fri Dec 01 23:07:05 1995  
Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapir.org  
(8.7.2/8.7.2) with ESMTP id XAA26410 for <hfsig@tapir.org>; Fri, 1 Dec 1995  
23:06:57 -0600 (CST)  
Received: from net-12.pta.pix.za (net-12.pta.pix.za [196.11.63.148]) by f15.pix.za  
(8.7.1/8.6.11) with SMTP id HAA26876 for <hfsig@tapir.org>; Sat, 2 Dec 1995  
07:07:19 +0200  
Date: Sat, 2 Dec 1995 07:07:19 +0200  
Message-Id: <199512020507.HAA26876@f15.pix.za>  
X-Sender: pak03226@pixie.co.za  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapir.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:728] Re: Loading problems with EVM56

I use to have endless pains with swopping com ports. Now I have installed  
another 2 com ports and configured them as com3 & 4 and leave the EVM and  
its ONCE on them permanently. So I don't have to diconnect the mouse every  
time. It seem to work OK.

73 danie

>Tom,  
>  
>>From what you describe it sounds like you have your COM port for the EVM not  
>set up right. Most PC's really only have two com port IRQ's (3 and 5), where  
>COM1/3 share IRQ 3 and COM2/4 share IRQ 5. If you connected your EVM to COM3  
>for instance and then have your mouse connected to COM1, then the debugger  
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>  
>--Johan  
>  
>  
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>>Hello All -  
>>

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>beieve I  
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>>modem. I first load BIOS.CLD via the debugger, and then try to load the  
modem  
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>help!!!  
>>  
>>73 de Tom, N9GUN  
>>tomob@ix.netcom.com  
>>  
>>  
>>  
>  
>

From danie.brynard@pixie.co.za Fri Dec 01 23:07:16 1995  
Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapr.org  
(8.7.2/8.7.2) with ESMTP id XAA26431 for <hfsig@tapr.org>; Fri, 1 Dec 1995  
23:07:10 -0600 (CST)  
Received: from net-12.pta.pix.za (net-12.pta.pix.za [196.11.63.148]) by f15.pix.za  
(8.7.1/8.6.11) with SMTP id HAA26885 for <hfsig@tapr.org>; Sat, 2 Dec 1995  
07:07:34 +0200  
Date: Sat, 2 Dec 1995 07:07:34 +0200  
Message-Id: <199512020507.HAA26885@f15.pix.za>  
X-Sender: pak03226@pixie.co.za  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapr.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:731] Negative Frequencies

Hi TOM

>  
> Danie: I think the email I sent you previously on  
>negative frequencies was not so clear. I had in my mind  
>some FFT frequency wrapping effects, and not purely the subject  
>of negative frequecies, for some reason.  
>  
> I have reread John Bloom (KE3Z) article in Sept 94 QEX,  
>and it is very clear. You should read this, as I think it will  
>explain better what I think your question was.  
>  
> To be concise: if you have a signal, then to get rid of  
>it's negative part, you must have the I- and Q- components. In  
>analog you use a 90-degree wideband phase shifter (or plus 45  
>and minus 45-degree shifters). In the digital world, you can  
>use a Hilbert transform to generate 90-degree phase shift. You

>end up with two quadrature signals, the I- and Q- components,  
>which unambiguously defines the positive (or negative, with a  
>sign change) frequency parts.  
>

Yes but that is the problem, once you have created this complex signal from the real input signal, how do you determine whether that resultant frequency is positive or negative ? It is not just a matter of looking at the sign of the signal, you have to calculate the sign by looking at two successive time samples of the complex signal to see which direction the complex phasor is turning.

I am looking for an elegant and easy way to do this. You can assume that I will have two time samples of the complex signal ie

y(t)=re1+jim1  
y(t-1)=re2+jim2

Now which way is the phasor turning ? Clockwise or anticlockwise ?

73 Danie

> I hope this is a better answer, if not please let me know.

>

> - Tom

>

>

>-----+-----  
> Tom McDermott | "All opinions expressed  
> Alcatel Network Systems, Inc. | are my own, and do not  
> mcdermot@aud.alcatel.com | represent those of Alcatel  
> [ ICC'96 Technical Program Secretary ] | Network Systems, Inc."  
> [ June 23-27, 1996, Dallas, Tx. ] |  
>-----+-----  
>  
>

From danie.brynard@pixie.co.za Fri Dec 01 23:07:18 1995

Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapr.org  
(8.7.2/8.7.2) with ESMTP id XAA26432 for <hfsig@tapr.org>; Fri, 1 Dec 1995  
23:07:13 -0600 (CST)

Received: from net-12.pta.pix.za (net-12.pta.pix.za [196.11.63.148]) by f15.pix.za  
(8.7.1/8.6.11) with SMTP id HAA26890 for <hfsig@tapr.org>; Sat, 2 Dec 1995  
07:07:38 +0200

Date: Sat, 2 Dec 1995 07:07:38 +0200

Message-Id: <199512020507.HAA26890@f15.pix.za>

X-Sender: pak03226@pixie.co.za

X-Mailer: Windows Eudora Version 1.4.4

Mime-Version: 1.0

Content-Type: text/plain; charset="us-ascii"

To: hfsig@tapr.org

From: danie.brynard@pixie.co.za (Danie Brynard)



Subject: Re: [HFSIG:732] Re: Loading problems with EVM56

Your mouse driver is probably still active and also receiving data from the EVM ?!

danie zs6awk

>>I have completed the building of the interface circuit for the EVM56. I believe I  
>>am having trouble in my procedures to load the code needed to run the multi-tone  
>>modem. I first load BIOS.CLD via the debugger, and then try to load the modem  
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>If you compiled the source for the DSPCARD4 the only difference  
>is in the data memory allocation, thus some blocks of data go into  
>different places of the DSP's RAM. Maybe this touches some vital  
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>  
>Pawel  
>  
>

From danie.brynard@pixie.co.za Fri Dec 01 23:07:24 1995  
Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id XAA26466 for <hfsig@tapir.org>; Fri, 1 Dec 1995 23:07:19 -0600 (CST)  
Received: from net-12.pta.pix.za (net-12.pta.pix.za [196.11.63.148]) by f15.pix.za (8.7.1/8.6.11) with SMTP id HAA26898 for <hfsig@tapir.org>; Sat, 2 Dec 1995 07:07:45 +0200  
Date: Sat, 2 Dec 1995 07:07:45 +0200  
Message-Id: <199512020507.HAA26898@f15.pix.za>  
X-Sender: pak03226@pixie.co.za  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapir.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:733] Re: BPSK modem for 1200 bps

We will have to ask James Miller G3RUH. My documentation says just raised cosine but your are of course right. The root is normally taken.

I will ask him or perhaps James are you seeing this ?

danie zs6awk

>>  
>> Webersat 18 has a 1200bps BPSK (on SSB) AX.25 uplink on 437.075MHz. It uses  
>> a Raised Cosine 1200bps BPSK (on SSB) AX.25 downlink on 437.102MHz.  
>  
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>  
>Also, you need to know the alpha factor. Transmitter and receiver must  
>use the same alpha factor to avoid ISI.  
>  
>Alan Bloom N1AL  
>  
>

From karn@qualcomm.com Mon Dec 04 08:10:22 1995  
Received: from zeus.qualcomm.com (zeus.qualcomm.com [129.46.50.42]) by  
sys1.tapir.org (8.7.2/8.7.2) with ESMTP id IAA14744 for <hfsig@tapir.org>; Mon, 4  
Dec 1995 08:10:20 -0600 (CST)  
Received: from qualcomm.com (qualcomm.com [192.35.156.11]) by zeus.qualcomm.com  
(8.7.1/QC-SOLARIS-2.3.1) with ESMTP id SAA18648 for <hfsig@tapir.org>; Sun, 3 Dec  
1995 18:06:22 -0800 (PST)  
Received: from drop064.internetMCI.ietf.org (drop064.internetMCI.ietf.org  
[206.103.69.64]) by qualcomm.com (8.6.12/8.6.12) with SMTP id SAA07502 for  
<hfsig@tapir.org>; Sun, 3 Dec 1995 18:06:47 -0800  
Message-Id: <199512040206.SAA07502@qualcomm.com>  
X-Sender: karn@servo.qualcomm.com (Unverified)  
X-Mailer: Windows Eudora Pro Version 2.1.2  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Sun, 03 Dec 1995 21:50:26 -0800  
To: hfsig@tapir.org  
From: Phil Karn <karn@qualcomm.com>  
Subject: Re: [HFSIG:736] Re: Negative Frequencies

At 11:24 PM 12/1/95 -0600, you wrote:

>y(t)=re1+jim1  
>y(t-1)=re2+jim2  
>  
>Now which way is the phasor turning ? Clockwise or anticlockwise ?

Seems pretty straightforward to me. Assuming no aliasing (an important  
assumption),  
all you have to do is convert the two samples to polar notation, computing just  
the angle part since that's all we're interested in here:

phi(t) = atan2(im1,re1)  
phi(t-1) = atan2(im2,re2)

where  $\text{atan2}(y,x) = \arctangent(y/x)$  with automatic quadrant placement. (Many math libraries since Fortrash days have this function built in.)

Now you just subtract the two angles mod  $2\pi$ . If one is, say,  $\pi/2$  larger than you can consider the vector to have rotated in that direction. Of course, it's also

possible that it rotated  $3\pi/2$  (270 deg) in the opposite direction, which is why it's important to assume no aliasing.

Phil

From karn@qualcomm.com Mon Dec 04 08:11:25 1995

Received: from zeus.qualcomm.com (zeus.qualcomm.com [129.46.50.42]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id IAA14777 for <hfsig@tapir.org>; Mon, 4 Dec 1995 08:11:17 -0600 (CST)

Received: from qualcomm.com (qualcomm.com [192.35.156.11]) by zeus.qualcomm.com (8.7.1/QC-SOLARIS-2.3.1) with ESMTP id FAA07133 for <hfsig@tapir.org>; Mon, 4 Dec 1995 05:56:57 -0800 (PST)

Received: from drop064.internetMCI.ietf.org (drop064.internetMCI.ietf.org [206.103.69.64]) by qualcomm.com (8.6.12/8.6.12) with SMTP id FAA20352 for <hfsig@tapir.org>; Mon, 4 Dec 1995 05:57:22 -0800

Message-Id: <199512041357.FAA20352@qualcomm.com>

X-Sender: karn@servo.qualcomm.com (Unverified)

X-Mailer: Windows Eudora Pro Version 2.1.2

Mime-Version: 1.0

Content-Type: text/plain; charset="us-ascii"

Date: Mon, 04 Dec 1995 09:41:00 -0800

To: hfsig@tapir.org

From: Phil Karn <karn@qualcomm.com>

Subject: Re: [HFSIG:725] Re: BPSK modem for 1200 bps

At 06:48 AM 11/30/95 -0600, you wrote:

>Also, some of the satellites have two different transmitters: the standard  
>one and a "raised cosine" transmitter. I think one of the two has failed  
>on one or more sats, so you find a mixture of signal types.

I've heard that at least one of the Microsats has problems with its PSK modulators that have cause the phase shift to deviate from antipodal (0/180 deg). One effect is

to add residual carrier. Another is to totally screw up Costas loops that depend on the signal being antipodal. If you work out what's happening, you can see that the data isn't properly cancelled from the VCO correction signal, causing considerable loop jitter. In fact, for certain phase shifts you can show that the loop doesn't even lock.

A modified demod should be able to deal with this problem. Offhand I'd suggest shifting the phase of the quadrature carrier to something other than 90 deg until the correction signal becomes clean again.

Phil

From JALOCHA@chopin.ifj.edu.pl Mon Dec 04 08:16:45 1995  
Received: from nms.cyf-kr.edu.pl (nms.cyf-kr.edu.pl [149.156.1.3]) by  
sys1.tapir.org (8.7.2/8.7.2) with SMTP id IAA15423 for <hfsig@tapir.org>; Mon, 4 Dec  
1995 08:16:40 -0600 (CST)  
From: JALOCHA@chopin.ifj.edu.pl  
Received: from CHOPIN.IFJ.EDU.PL (chopin.ifj.edu.pl [192.86.14.9]) by nms.cyf-  
kr.edu.pl (8.6.11/8.6.11) with SMTP id MAA15282 for <@NMS.CYF-  
KR.EDU.PL:hfsig@tapir.org>; Mon, 4 Dec 1995 12:24:46 +0100  
Date: Mon, 4 Dec 1995 12:20 GMT+1  
Subject: Re: [HFSIG:738] Re: BPSK modem for 1200 bps  
To: hfsig <@NMS.CYF-KR.EDU.PL:hfsig@tapir.org>  
Message-id: <CB6A0B4D0020B1C3@chopin.ifj.edu.pl>  
X-Envelope-to: @NMS.CYF-KR.EDU.PL:hfsig@tapir.org  
X-VMS-To: IN%"<@NMS.CYF-KR.EDU.PL:hfsig@tapir.org>"

>We will have to ask James Miller G3RUH. My documentation says just raised  
>cosine but your are of course right. The root is normally taken.

So what is mathematically the root raised cosine ?  
Is it  $\sin(x)/x$  ?

The other thing is that I would like to know which filter to use  
on the \_receiver\_ side. Suppose the transmitter is raised cosine:  
 $0.5+0.5*\cos(x)$  for  $x = -\pi..+\pi$  what should be the receiver's shape ?  
I suspect you need  $\sin(x)/x...$  but this one is infinitely long !

Over the weekend I scaled the BPSK modem the other way, down  
to 30 bps. Then I made up a simple terminal interface:

- pressing Ctrl-T keys the transmitter
- pressing Ctrl-R releases the PTT
- any other character gets transmitted on the carrier as a 7-bit ASCII  
in asynchronous-like format.
- Any received character is printer on the screen

The signal's bandwidth is some 30 Hz at -6dB and 60 Hz at -50 dB.  
The specific operating feature is that the receiver sweeps its carrier  
within given margins to find the lock and this takes time...  
for +/- 20 Hz sweep the lock may take 5-15 seconds.  
The transmitting station needs to send that much of idle/dummy  
information.

If there is some interest I could go on and add some FEC...

Paweł

From mcdermot@rdxsunhost.aud.alcatel.com Mon Dec 04 09:57:39 1995  
Received: from aud.alcatel.com (rockdal.aud.alcatel.com [128.251.30.1]) by  
sys1.tapir.org (8.7.2/8.7.2) with SMTP id JAA21697 for <hfsig@tapir.org>; Mon, 4 Dec  
1995 09:57:33 -0600 (CST)  
Received: from rdxsunhost.aud.alcatel.com.Aud.Alcatel.COM by aud.alcatel.com (4.1/  
SMI-4.1)  
id AA05013; Mon, 4 Dec 95 09:49:33 CST  
Received: from eagle.aud.alcatel.com by rdxsunhost.aud.alcatel.com.Aud.Alcatel.COM

(4.1/SMI-4.1)

id AA23003; Mon, 4 Dec 95 09:49:31 CST

Received: by eagle.aud.alcatel.com (4.1/SMI-4.1)

id AA02311; Mon, 4 Dec 95 09:49:31 CST

Date: Mon, 4 Dec 95 09:49:31 CST

From: mcdermot@rdxsunhost.aud.alcatel.com (Tom Mcdermott)

Message-Id: <9512041549.AA02311@eagle.aud.alcatel.com>

To: hfsig@tapr.org

Subject: Re: Negative Frequencies

> Yes but that is the problem, once you have created this complex signal from  
> the real input signal, how do you determine whether that resultant frequency  
> is positive or negative ? It is not just a matter of looking at the sign of  
> the signal, you have to calculate the sign by looking at two successive time  
> samples of the complex signal to see which direction the complex phasor is  
> turning.

>

> I am looking for an elegant and easy way to do this. You can assume that I  
> will have two time samples of the complex signal ie

>

>  $y(t) = \text{re1} + j\text{im1}$

>  $y(t-1) = \text{re2} + j\text{im2}$

>

> Now which way is the phasor turning ? Clockwise or anticlockwise ?

>

> 73 Danie

OK. According to the definition previously, a phasor rotation of counter-clockwise is POSITIVE frequency (the imaginary part is 90-degrees delayed from the real part). Convention is that zero-degrees is the EAST point of the graph.

Now we have to understand the nature of the signals in order to develop an algorithm. Let's start with the simplest case - single frequency (or very narrow bandpass). Assume that the sampling rate is high enough so that we can localize the zero-crossing of the signals. Then at the time of the positive-going zero-crossing of the real axis, the imaginary will be 90-degrees later, and thus will be a negative voltage (when the frequency is positive). If the frequency is negative, then the voltage would be positive on the imaginary signal at that time.

After this, it starts to get complicated. For a wideband signal, each frequency component is delayed by 90-degrees, thus the amount of delay is proportional to frequency. So for a wideband signal, the waveform shape of the imaginary signal is not so obvious as compared to the real signal. If we perform a Hilbert transform on the real data, we will add another 90-degrees of delay to it, resulting in a total of 180-degrees. If the transformed-imaginary data is the inverse-sign of the real data, then we know that the signal was positive frequency. However, if the transformed-imaginary data is the

same-sign

as the real data, then we know that the signal was negative frequency.

I am not sure if there is a simple expression for comparing the complex time-domain samples  $y(t)$ ,  $y(t-1)$  to determine the phasor rotation direction in the general case. If the signal has been filtered enough, then it is possible, but if the signal is fairly wideband, then it is more difficult.

I have not explored this latter case, and do not have a reference to the literature.

- Tom, N5EG

```
-----+-----
Tom McDermott                | "All opinions expressed
Alcatel Network Systems, Inc. | are my own, and do not
mcdermot@aud.alcatel.com     | represent those of Alcatel
[ ICC'96 Technical Program Secretary ] | Network Systems, Inc."
[ June 23-27, 1996, Dallas, Tx. ]    |
-----+-----
```

----- End Included Message -----

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-----+-----
Tom McDermott                | "All opinions expressed
Alcatel Network Systems, Inc. | are my own, and do not
mcdermot@aud.alcatel.com     | represent those of Alcatel
[ ICC'96 Technical Program Secretary ] | Network Systems, Inc."
[ June 23-27, 1996, Dallas, Tx. ]    |
-----+-----
```

From N10BU@MINDPORT.NET Mon Dec 04 10:32:02 1995  
Received: from polaris (root@polaris.mindport.net [205.219.167.2]) by  
sys1.tappr.org (8.7.2/8.7.2) with SMTP id KAA23035 for <hfsig@tappr.org>; Mon, 4 Dec  
1995 10:31:58 -0600 (CST)  
Received: from synapse-51.mindport.net (synapse-51.mindport.net [205.219.167.70])  
by polaris (8.6.12/8.6.12) with SMTP id LAA05196 for <hfsig@tappr.org>; Mon, 4 Dec  
1995 11:31:51 -0500  
Posted-Date: Mon, 4 Dec 1995 11:31:51 -0500  
From: N10BU@MINDPORT.NET (Douglas M. Pervine)  
To: hfsig@tappr.org  
Subject: Motorola DSP?  
Date: Thu, 29 Oct 1959 09:55:34 GMT  
Message-Id: <ecdc33b4.471146@MAIL.MINDPORT.NET>  
X-Mailer: Forte Agent .99c/16.141

I'm looking for some General/Technicial information about the

Motorola DSP 56002EVM. I've searched Motorola's Home Page and found nothing. Thanks!

--73's  
V/R DMP

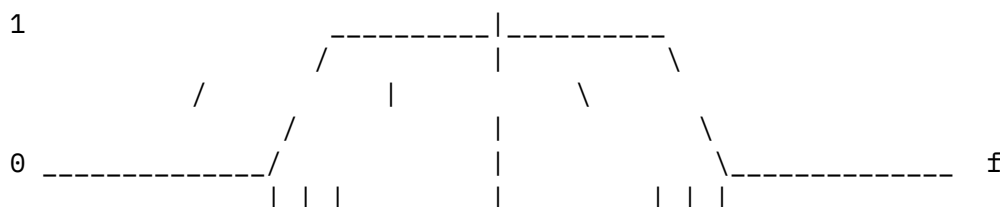
From alanb@tsnake2.sr.hp.com Mon Dec 04 11:51:22 1995  
Received: from relay.hp.com (relay.hp.com [15.255.152.2]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id LAA26275 for <hfsig@tapir.org>; Mon, 4 Dec 1995 11:51:18 -0600 (CST)  
Received: from srmail.sr.hp.com by relay.hp.com with ESMTP (1.37.109.16/15.5+ECS 3.3) id AA011129471; Mon, 4 Dec 1995 09:51:11 -0800  
Received: from tsnake2.sr.hp.com by srmail.sr.hp.com with ESMTP (1.37.109.16/15.5+ECS 3.3) id AA117359469; Mon, 4 Dec 1995 09:51:10 -0800  
Received: by tsnake2.sr.hp.com (1.37.109.16/15.5+ECS 3.3) id AA084949468; Mon, 4 Dec 1995 09:51:08 -0800  
From: Alan Bloom <alanb@tsnake2.sr.hp.com>  
Message-Id: <199512041751.AA084949468@tsnake2.sr.hp.com>  
Subject: Re: [HFSIG:741] Re: BPSK modem for 1200 bps  
To: hfsig@tapir.org  
Date: Mon, 4 Dec 1995 09:51:08 -0800 (PST)  
In-Reply-To: <CB6A0B4D0020B1C3@chopin.ifj.edu.pl> from "hfsig@tapir.org" at Dec 4, 95 08:26:55 am  
X-Mailer: ELM [version 2.4 PL21]  
Mime-Version: 1.0  
Content-Type: text/plain; charset=US-ASCII  
Content-Transfer-Encoding: 7bit

> So what is mathematically the root raised cosine ?  
> Is it  $\sin(x)/x$  ?

A (non-root) raised-cosine filter has a frequency response that is (what else) a raised cosine:

$$\begin{aligned} P(f) &= 1 & |f| &\leq (1-\alpha) \\ P(f) &= 0.5 \left( 1 + \cos \left( \pi \frac{f - (1-\alpha)}{2\alpha} \right) \right) & (1-\alpha) < |f| < (1+\alpha) \\ P(f) &= 0 & |f| &\geq (1+\alpha) \end{aligned}$$

Where the amplitude and the cutoff frequency (half-amplitude point) have been normalized to 1. (The cutoff frequency is at 1/2 the symbol rate.)



$$\begin{array}{cccc}
 -(1+\alpha) & | & -(1-\alpha) & | & 1-\alpha & | & 1+\alpha \\
 & | & & | & & | & \\
 & -1 & & 0 & & 1 & 
 \end{array}$$

The root raised-cosine filter has the square root of that frequency response. That makes the cutoff frequency the half-power point, rather than the half-amplitude point.

The time-domain response of the raised-cosine is a weighted sinc function:

$$p(t) = \text{sinc}(2t) \frac{\cos(2\pi\alpha t)}{1 - 16(\alpha)^2 t^2}$$

where  $\text{sinc}(x) = \sin(\pi x) / (\pi x)$ . Since  $\sin(2\pi t)$  equals zero for  $t = 1, 2, 3, \dots$  the total signal is zero at the decision points of all adjacent symbols. i.e. no inter-symbol interference = Nyquist filter.

The time-response for a ROOT raised-cosine filter is more complicated, and does NOT go to zero at the unwanted decision points. So if you try to receive a root-Nyquist signal without using the complementary root-Nyquist filter in the receiver, you will have severe inter-symbol interference.

If the transmitter uses a (non-root) raised-cosine filter, then the receiver must also use a Nyquist filter of some type to avoid inter-symbol interference.

Both the raised-cosine and root raised-cosine filters theoretically have a time response that goes out to  $\pm$  infinity. So of course a practical FIR filter must be truncated. Actually, you usually use some windowing function for the purpose, to minimize ripple in the frequency response. After windowing, a Nyquist filter will remain Nyquist. However, a root-Nyquist filter may show some (usually small) inter-symbol interference, depending on how the windowing is done.

Alan Bloom N1AL

From forrerj@ucs.orst.edu Mon Dec 04 13:11:47 1995  
 Received: from ucs.orst.edu (forrerj@UCS.ORST.EDU [128.193.4.5]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id NAA29521 for <hfsig@tapir.org>; Mon, 4 Dec 1995 13:11:43 -0600 (CST)  
 Received: by ucs.orst.edu; (5.65v3.0/1.1.8.2/24Sep94-1201PM)  
     id AA10729; Mon, 4 Dec 1995 11:11:29 -0800  
 Date: Mon, 4 Dec 1995 11:11:29 -0800 (PST)  
 From: Johan Forrer <forrerj@ucs.orst.edu>  
 To: hfsig@tapir.org  
 Subject: Re: [HFSIG:743] Motorola DSP?  
 In-Reply-To: <ecdc33b4.471146@MAIL.MINDPORT.NET>  
 Message-Id: <Pine.OSF.3.91.951204110607.10368A-100000@ucs.orst.edu>  
 Mime-Version: 1.0  
 Content-Type: TEXT/PLAIN; charset=US-ASCII

Douglas,



You should check out an article that I wrote about the EVM in QEX (I think August 1995 - The ARRL publishes QEX and you should be able to obtain back issues from them) "Using the Motorola DSP56002 EVM for Amateur Radio DSP". You will find it a useful source of information on various Amateur radio-related projects that you can use the EVM for. Also some technical details of the hardware/software of the EVM.

--Johan Forrer, KC7WW

On Mon, 4 Dec 1995, Douglas M. Pervine wrote:

> I'm looking for some General/Technical information about the  
> Motorola DSP 56002EVM. I've searched Motorola's Home Page and found  
> nothing. Thanks!  
>  
> --73's  
> V/R DMP  
>  
>

From dwborden@ns1.panenet.com Mon Dec 04 18:10:12 1995  
Received: from ns1.panenet.com ([206.33.152.3]) by sys1.tapr.org (8.7.2/8.7.2)  
with SMTP id SAA12385 for <hfsig@tapr.org>; Mon, 4 Dec 1995 18:10:08 -0600 (CST)  
Received: from TARDIS by ns1.panenet.com (NTMail 3.00.06) id aa000772 Tue, 5 Dec  
95 00:12:52 -0400 (EDT)  
Message-ID: <30C38D8A.7FCB@panenet.com>  
Date: Mon, 04 Dec 1995 19:08:42 -0500  
From: David Wilson Borden <dwborden@ns1.panenet.com>  
X-Mailer: Mozilla 2.0b2 (Windows; I; 32bit)  
MIME-Version: 1.0  
To: hfsig@tapr.org  
Subject: Re: [HFSIG:743] Motorola DSP?  
References: <ecdc33b4.471146@MAIL.MINDPORT.NET>  
Content-Type: text/plain; charset=us-ascii  
Content-Transfer-Encoding: 7bit

I to followed the Motorola Web page and did not find a good description, just hype about what it does. A really good start is the August 1995 QEX article "Using the Motorola DSP56002EVM for Amateur Radio DSP Projects by Johan Forrer, KC7WW. After you read that, you could download EVM56K1.ZIP from the TAPR Web Page vector to ftp.tapr.org/tapr/SIG/hfsig/upload. I did that and now have a floppy disk full of source code to study. The code is commented well and if you have the 56000 family manual or the User's Manual, you should be able to follow along. I just have to figure out how to read the schematic of the interface circuit I downloaded.....David,K8MM0/HP2

From JALOCHA@chopin.ifj.edu.pl Tue Dec 05 09:27:57 1995  
Received: from nms.cyf-kr.edu.pl (nms.cyf-kr.edu.pl [149.156.1.3]) by sys1.tapr.org (8.7.2/8.7.2) with SMTP id JAA12054 for <hfsig@tapr.org>; Tue, 5 Dec 1995 09:27:51 -0600 (CST)

From: JALOCHA@chopin.ifj.edu.pl  
Received: from CHOPIN.IFJ.EDU.PL (chopin.ifj.edu.pl [192.86.14.9]) by nms.cyf-kr.edu.pl (8.6.11/8.6.11) with SMTP id NAA00310 for <@NMS.CYF-KR.EDU.PL:hfsig@tapr.org>; Tue, 5 Dec 1995 13:36:24 +0100  
Date: Tue, 5 Dec 1995 13:32 GMT+1  
Subject: Re: [HFSIG:744] Re: BPSK modem for 1200 bps  
To: hfsig <@NMS.CYF-KR.EDU.PL:hfsig@tapr.org>  
Message-id: <9E97B07D6020C543@chopin.ifj.edu.pl>  
X-Envelope-to: @NMS.CYF-KR.EDU.PL:hfsig@tapr.org  
X-VMS-To: IN%"<@NMS.CYF-KR.EDU.PL:hfsig@tapr.org>"

>A (non-root) raised-cosine filter has a frequency response that is  
>(what else) a raised cosine:  
>....

At least some concrete math, Thanks Alan !

Pawel

From frode@dxcern.cern.ch Wed Dec 06 03:25:02 1995  
Received: from dxmint.cern.ch (dxmint.cern.ch [128.141.1.113]) by sys1.tapr.org (8.7.2/8.7.2) with SMTP id DAA26502 for <hfsig@tapr.org>; Wed, 6 Dec 1995 03:24:58 -0600 (CST)  
Received: from dxcern.cern.ch by dxmint.cern.ch  
id AA23800; Wed, 6 Dec 1995 10:24:22 +0100  
Received: by dxcern.cern.ch (5.65/DEC-Ultrix/4.3)  
id AA04753; Wed, 6 Dec 1995 10:24:20 +0100  
Date: Wed, 6 Dec 1995 10:24:20 +0100 (MET)  
From: Frode Weierud <frode@dxcern.cern.ch>  
To: HFSIG TAPR <hfsig@tapr.org>  
Subject: Matlab and DigComT  
Message-Id: <Pine.ULT.3.91.951206085803.254A-1000000@dxcern.cern.ch>  
Mime-Version: 1.0  
Content-Type: TEXT/PLAIN; charset=US-ASCII

Hi all,

Some of you might be better off financially than me or have a possibility to acquire a tool like DigComT through your place of work. I should like to state that I have no interest in DigComT or Native Intelligence and that this posting should not be seen as an advert for DigComT, but purely information for fellow hams. You might also like to visit the DigComT WWW Home Page at <http://Ukulele.ee.cornell.edu/DCT/>

Here is a copy of my communication with Native Intelligence:

>From linda.heegard@cornell.eduWed Dec 6 08:56:02 1995  
Date: Tue, 5 Dec 1995 23:18:35 -0500  
From: Linda-Marie Heegard <linda.heegard@cornell.edu>  
To: Frode Weierud <frode@dxcern.cern.ch>  
Subject: Re: Info about DigComT

>Dear Chris,

>  
>I am a radio amateur with a strong interest in the development of HF  
>digital modems using DSP techniques. I have recently bought the student  
>version of Matlab to allow me to better simulate some of these modems  
>before trying to implement them on a DSP platform.  
>  
>I have just heard about DigComT and I have had a quick look at what it can  
>do. It appears to fulfil all my best dreams about a simulation and  
>analysis packages, but can I run DigComT on the Matlab student version?  
  
>As all my research is done as a radio ham and on a private, very tight  
>budget I am wondering if you have a student version of DigComT as well?  
>  
>Best regards,  
>Frode, LA2RL  
>--  
>Frode Weierud Phone : 41 22 7674794  
>CERN, SL Fax : 41 22 7679185  
>CH-1211 Geneva 23, Switzerland E-mail : frode@dxcern.cern.ch

-----  
Frode,

We are not sure at this time if DigComT will run on the MatLab student version but we believe it will. If you are seriously interested in purchasing the product we will verify that it works beforehand. In any case here is some additional information that might be helpful.

The standard educational discount for a single user license is 50% off the standard price. If you intend to use the toolbox for many students in a course, a group discount is possible. I'm also willing to listen to any interesting proposals.

Let me know if I can answer any other questions for you.

-Linda-Marie

-----  
DigComT  
The Digital Communications Toolbox

Thanks for your interest in DigComT. If you want to purchase a copy, or would like more detailed information (e.g., a table of contents or a manual), please contact me directly. I have enclosed the basic price structure for the product (note: there is an educational discount available) as well as some information about it's functions and my biography. I have also attached a copy of a typical software agreement.

Please feel free to ask any questions you might have about DigComT. I look forward to hearing from you.

Sincerely,

Price -

DigComT is priced at \$1,995 per single user copy (unix), \$895 (windows or mac). Owners are required to sign a software agreement to use this product.

---

Introduction-

DigComT provides a variety of useful tools for the analysis, design and development of modern digital communications systems, using the commercially available program Matlab (required to use with DigComT). The system is designed to work on all the major platforms for which Matlab is available (most notably, Unix, Macintosh and Windows). The toolbox consists of a large number of Matlab ".m" files (source files of Matlab code) as well as a number of ".mex" files (binary files of "C" code that is callable in Matlab). The former files allow for the analysis of a variety of digital communications systems, while the latter allow for efficient simulation capabilities.

DigComT consists of the following packages -

\* Analysis - analytical tools

Consists of a number of analytical tools for understanding digital communications systems. Methods of estimating channels capacity and error rate performance are typical tools found here.

\* ChanlSim - channel simulation

Provides a method for modeling the noise and interference of digital communication transmission. Includes tools for modeling analog transmission systems, colored noise and channel impairments such as filtering, echos and multipath.

\* Compress - compression tools

Tools to study common analog source coding techniques (APCM, ADPCM) and other compression tools, such as Huffman coding, are provided.

\* DataFnc - data functions

Functions to manipulate and organize data. Bitwise logical functions (e.g., and, or, xor, logical\_shift) as well as buffering and mapping functions are found here.

\* DCTdemos - demonstration programs

Examples of the use of the toolbox. Useful for learning how the toolbox can be used.

\* DCTUtils - utilities

A library of common utility functions common to DigComT.

\* Discrete - discrete math function

Discrete numerical functions such as combinatorical functions (e.g., binomial and multinomial functions) and number theoretic quantities are presented.

\* FEC - forward error control

Forward error-correction tools that include: Trellis coding (convolutional codes, QAM trellis codes and Viterbi decoding), Block

coding (Reed-Solomon and BCH codes) and interleaving simulation.

- \* FFLib - finite fields library

A library of tools for finite field computations (useful for studying algebraic coding techniques).

- \* FileFnc - file functions

A library of common file manipulation functions for use in DigComT.

- \* Modem - modem simulation functions

Simulation tools for modeling modulation and demodulation processes. A variety of modulations are supported (PAM, QAM, PSK, ...). Tools for developing receiver structures involving AGC, carrier recovery, symbol timing recovery and adaptive equalization are provided.

- \* Numeric - Numerical functions

Numerical functions used in the study and simulation of digital communications systems. Examples include quantizers, mean-squared estimators (LMS and RLS), and information theoretic functions (entropy and mutual information).

- \* PlotFnc - plotting functions

A library of plotting functions common to DigComT. Examples include functions to plot signal constellations and eye patterns.

- \* RandSig - random signal functions

Deals with methods of generating and manipulating a variety of random signals commonly required for digital communications.

- \* Signals - deterministic signal functions

Deals with methods of generating and manipulating a variety of deterministic signals commonly required for digital communications.

---

#### About the Author-

Chris Heegard was born in Pasadena, California, on October 4, 1953. He received the BS and the MS degrees in electrical and computer engineering from the University of Massachusetts, Amherst, MA, in 1975 and 1976, respectively, and the Ph.D. degree in electrical engineering from Stanford University, Stanford, CA, in 1981.

From 1976-1978, he was an R&D Engineer at Linkabit Corp., San Diego, CA, where he worked on the development of a packet switched satellite modem and several sequential decoders for the decoding of convolutional codes. In 1981, he joined the faculty of the School of Electrical Engineering, Cornell University, Ithaca, NY, as an Assistant Professor; he was appointed to Associate Professor, with tenure, in 1987.

At Cornell, Professor Heegard teaches courses in digital communications, error control codes, information theory, detection and estimation theory, digital systems and audio engineering. His current research interests include: information, coding and communication theory, algorithms for digital communications, coding for computer memory systems, signal processing and error-control in optical and magnetic recording systems, audio and video signal compression, algebraic geometric coding theory and symbolic and numerical computer methods.

Dr. Heegard is an active member of the consulting community. He has worked on problems of digital HDTV and cable TV transmission, DSP and hardware based trellis coded modems, modulation and error-control for

optical LANs, and modulation and coding for recording systems.

In 1984, Dr. Heegard received the Presidential Young Investigator Award from the National Science Foundation and the IBM Faculty Development Award. He has ongoing research support from the NSF as well as ARO and NSA. Chris has been involved in the organization of several IEEE workshops and symposia. In 1986, he was elected to the Board of Governors of the Information Theory Society of the IEEE and reelected in 1989. In 1994 he was IT President; he is currently Past-President of the group. He is a fellow of IEEE, and a member of AES and Eta Kappa Nu.

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DigComT  
The Digital Communications Toolbox

In using The Digital Communications Toolbox , we \_\_\_\_\_ (XX)  
agree to the following terms:

\* This is a single user license for this software, running only under a licensed version of Matlab from the MathWorks Inc., (24 Prime Park Way, Natick, MA 01760, (518) 653-1415)

\* Native Intelligence (NI) supplies all the ".m" files, documentation files and ".mex" files. The ".mex" files are provided in binary form only. It is understood that these file are copyrighted and are not to be distributed, in original or altered form, without the express written permission of NI.

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\* NI provides a number of test programs to demonstrate how these routines are to be used within Matlab.

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\* More direct assistance on learning Matlab or extending the capabilities of the package will be performed on a consulting basis, at our usual rates, or within some other arrangement.

For \_\_\_\_\_ (XX):  
Signature: \_\_\_\_\_  
Name/Position: \_\_\_\_\_  
Date: \_\_\_\_\_

-----  
Chris Heegard  
Native Intelligence  
4 Woodland Rd. Ithaca, New York 14850  
(607) 539-6643 (Voice), 539-6509 (Fax)  
heegard@ee.cornell.edu  
WWW - "http://Ukulele.ee.cornell.edu/DCT/"  
-----

Linda-Marie Heegard -

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+ (607) 539-6643 (voice), 539-6509 (fax) +\_\_\_\_\_  
+ +\_\_\_\_\_  
+ WWW - "http://Ukulele.ee.cornell.edu/DCT/" +\_\_\_\_\_  
-----

73's Frode

Frode Weierud Phone : 41 22 7674794  
CERN, SL Fax : 41 22 7679185  
CH-1211 Geneva 23, Switzerland E-mail : frode@dxcern.cern.ch

From lay@cod.nosc.mil Wed Dec 06 10:31:01 1995  
Received: from trout.nosc.mil (trout.nosc.mil [128.49.16.7]) by sys1.tapir.org  
(8.7.2/8.7.2) with SMTP id KAA09171 for <hfsig@tapir.org>; Wed, 6 Dec 1995 10:30:58  
-0600 (CST)

Received: from marlin.nosc.mil by trout.nosc.mil (4.1/SMI-4.1)  
id AA06695; Wed, 6 Dec 95 08:30:43 PST  
Received: from sam.nosc.mil by marlin.nosc.mil (4.1/SMI-4.1)  
id AA15466; Wed, 6 Dec 95 08:30:54 PST  
Date: Wed, 6 Dec 95 08:30:54 PST  
Message-Id: <9512061630.AA15466@marlin.nosc.mil>  
X-Sender: lay@cod.nosc.mil  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapr.org  
From: lay@cod.nosc.mil (Richard Lay)  
Subject: M-ary FSK interference  
X-Mailer: <Windows Eudora Version 2.0.2>

Hello.

Does anyone know a reference discussing the performance of M-ary FSK with various types of interference? I'm looking for theoretically, simulated, or experimentally derived curves (or equations) showing the probability of symbol error given a signal to interference ratio. I've found such a reference when the interference is gaussian. What if the interference is CW or linear FM? What if it's something else, other than gaussian?

Thanks.

Richard Lay

From kurpiers@zeus.uet.e-technik.th-darmstadt.de Wed Dec 06 13:39:20 1995  
Received: from rs2.hrz.th-darmstadt.de (rs2.hrz.th-darmstadt.de [130.83.22.63]) by sys1.tapr.org (8.7.2/8.7.2) with SMTP id NAA04133 for <hfsig@tapr.org>; Wed, 6 Dec 1995 13:38:08 -0600 (CST)  
Received: from zeus (zeus.uet.e-technik.th-darmstadt.de [130.83.18.75]) by rs2.hrz.th-darmstadt.de (8.6.12/8.6.12.1ms) with ESMTP id UAA138232 for <hfsig@tapr.org>; Wed, 6 Dec 1995 20:37:54 +0100  
Received: from hades.uet.e-technik.th-darmstadt.de (hades.uet.e-technik.th-darmstadt.de [130.83.18.78]) by zeus (8.7.1/8.6.9-HRZ) with ESMTP id UAA21418 for <hfsig@tapr.org>; Wed, 6 Dec 1995 20:37:53 +0100  
Received: (from kurpiers@localhost) by hades.uet.e-technik.th-darmstadt.de (8.7.1/8.7.1-HRZ-Fwd2.2) id UAA07144; Wed, 6 Dec 1995 20:37:53 +0100  
Date: Wed, 6 Dec 1995 20:37:52 +0100 (MEZ)  
From: Alexander Kurpiers <kurpiers@zeus.uet.e-technik.th-darmstadt.de>  
To: hfsig@tapr.org  
Subject: Re: [HFSIG:748] Matlab and DigComT  
In-Reply-To: <Pine.ULT.3.91.951206085803.254A-100000@dxcern.cern.ch>  
Message-ID: <Pine.A32.3.91.951206201749.7577A-100000@hades.uet.e-technik.th-darmstadt.de>  
MIME-Version: 1.0  
Content-Type: TEXT/PLAIN; charset=US-ASCII

>Some of you might be better off financially than me or have a possibility  
>to acquire a tool like DigComT through your place of work. I should like

This is too expensive for us, too...

I use "ptolemy" under AIX and linux. This is free software and really



fast compared to Matlab based systems (which is basically an interpreter).

Have a look at <http://ptolemy.eecs.berkeley.edu/>

I have made channel simulators for the HF channel (Watterson modell) running under ptolemy. Currently I'm analysing different OFDM systems (frequency and time differential modulation).

BTW my realtime HF channel simulator is running! One of our students did it as his final project. The simulator is running on a DSPCOM (40MHz TMS320c26). It should run on the c26-EVM board with some small changes. I hope I can post the sources (after some small changes) to the ftp-site.

73' Alexander

```
*-----+-----*
|      Alexander F. Kurpiers      |
| Institut f. Uebertragungstechnik | Voice: +49-6151-162369 |
| u. Elektroakustik              | Fax  : +49-6151-165545 |
| Merckstrasse 25                 | EMail: a.kurpiers@uet.th-darmstadt.de |
| D-64283 Darmstadt (Germany)     | Hamradio: dl8aau@db0zdf.#rpl.deu.eu  |
*-----+-----*
```

From karn@qualcomm.com Thu Dec 07 12:42:24 1995

Received: from zeus.qualcomm.com (zeus.qualcomm.com [129.46.50.42]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id MAA23953 for <hfsig@tapir.org>; Thu, 7 Dec 1995 12:42:17 -0600 (CST)

Received: from qualcomm.com (qualcomm.com [192.35.156.11]) by zeus.qualcomm.com (8.7.3/8.7.2/1.2) with ESMTP id KAA19952 for <hfsig@tapir.org>; Thu, 7 Dec 1995 10:41:38 -0800 (PST)

Received: from drop064.internetMCI.ietf.org (drop064.internetMCI.ietf.org [206.103.69.64]) by qualcomm.com (8.6.12/8.6.12) with SMTP id KAA20288; Thu, 7 Dec 1995 10:42:04 -0800

Message-Id: <199512071842.KAA20288@qualcomm.com>

X-Sender: karn@servo.qualcomm.com (Unverified)

X-Mailer: Windows Eudora Pro Version 2.1.2

Mime-Version: 1.0

Content-Type: text/plain; charset="us-ascii"

Date: Thu, 07 Dec 1995 14:25:33 -0800

To: hfsig@tapir.org, hfsig@tapir.org

From: Phil Karn <karn@qualcomm.com>

Subject: Re: [HFSIG:749] M-ary FSK interference

At 10:45 AM 12/6/95 -0600, Richard Lay wrote:

>Hello.

>Does anyone know a reference discussing the performance of M-ary FSK with

>various types of interference? I'm looking for theoretically, simulated, or  
>experimentally derived curves (or equations) showing the probability of  
>symbol error given a signal to interference ratio. I've found such a  
>reference when the interference is gaussian. What if the interference is CW  
>or linear FM? What if it's something else, other than gaussian?

Yes. Several of the textbooks on modulation and coding theory discuss the theory and performance of m-ary orthogonal modulation, of which M-ary FSK is an example. (All m-ary orthogonal schemes perform exactly the same as long as the implementation losses are the same).

A few good references are Digital Communications by Proakis (the 3rd edition just came out) and my personal favorite, Digital Modulation and Coding by Wilson (also brand new).

I will assume noncoherent demodulation, which is the usual reason for using M-ary orthogonal modulation. The demodulator correlates the incoming signal against reference copies of each of the orthogonal basis functions (e.g., carrier frequencies for M-ary FSK), accumulates the resulting energies over the symbol time into M bins, and takes the bin with the largest result as the output symbol. The probability of a correct decision is therefore the probability that the correct bin energy exceeds all the incorrect bin energies.

For M-ary FSK, the demodulator can just be the FFT with each bin containing the sum of the squares of the sine and cosine components.

In gaussian noise, the bin energies will be Rayleigh distributed for all the "wrong" channels and Ricean for the correct bin. (The Ricean distribution resembles a Rayleigh distribution when the S/N ratio is low, and it becomes a nonzero mean Gaussian when the S/N is high.) You analyze the performance of the demodulator in noise by basically looking at the areas under the distribution tails. You can do this by analytical means, but it's pretty hairy (even though the result is simple) because of the nonlinearity in the comparisons. And it's already been done in the books I mentioned.

For nongaussian noise, a Monte Carlo simulation is probably the most practical. In CW interference, you'll get the right answer only if the energy in the right bin exceeds the CW energy in the wrong bin (assuming the CW is much stronger than the noise, of course).

To improve performance against interference, you could apply a forward error correcting code plus a whitening filter. That is, when the desired transmitter is off the air, you run the demod for a while and look at the energies in each bin. In white noise (or QRM) they will be approximately equal. If the noise isn't white (e.g., with strong CW QRM) one or more bins will greatly exceed the others. "Whiten" the signal before demodulation by adjusting the gain of each bin so they're again roughly equal.

Since this causes the desired signal to be notched out when it happens to land on the CW QRM, you'll occasionally get errors. That's what the FEC is for. As long as you scramble the data such that each bin (tone) is equally likely, then your probability of error due to QRM will be something like  $1/N$  where  $N$  is the number of bins (tones), and if this is within your error correction capability you'll get error free data despite the QRM. Assuming of course that the QRM isn't so strong that intermodulation distortion or FFT "leakage" blots out multiple bins.

Again, Monte Carlo simulation is probably your best bet for getting real numbers when the situation is complex, e.g., if the interference is changing frequency or amplitude.

The nonlinearity in the bin comparison is what makes it impossible to improve noncoherent demodulation performance indefinitely by lowering the FEC code rate, unlike coherently demodulated PSK.

At some point the increased loss due to the demodulator nonlinearity more than swamps the extra coding gain from the lower rate FEC. The optimum code rate depends on the value of  $M$  and whether the channel is AWGN or fading. For typical values of  $M$  (16 or 32) on AWGN, there's a broad optimum around rate  $1/2$ . For a Rayleigh fading channel the optimum is narrower and depends more strongly on  $M$ ; for  $M=32$  the optimum is about rate  $1/10$ . Wilson's book has an excellent set of graphs that show this.

Phil

From forrerj@ucs.orst.edu Fri Dec 08 17:27:18 1995  
Received: from ucs.orst.edu (root@UCS.ORST.EDU [128.193.4.5]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id RAA25571 for <hfsig@tapir.org>; Fri, 8 Dec 1995 17:27:15 -0600 (CST)  
Received: from p09.t0.monrotel.com by ucs.orst.edu; (5.65v3.0/1.1.8.2/24Sep94-1201PM)  
id AA24952; Fri, 8 Dec 1995 15:26:50 -0800  
Message-Id: <9512082326.AA24952@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Fri, 08 Dec 1995 15:30:35 -0800  
To: hfsig@tapir.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: Re: [HFSIG:750] Re: Matlab and DigComT

Hello Alexander,

I have a brief break (a day or two) - so time to catch up.

>

>>Some of you might be better off financially than me or have a possibility  
>>to acquire a tool like DigComT through your place of work. I should like

>

>This is too expensive for us, too...

>

>I use "ptolemy" under AIX and linux. This is free software and really  
>fast compared to Matlab based systems (which is basically an interpreter).

>

>Have a look at <http://ptolemy.eecs.berkeley.edu/>

How big a Linux box do you need (memory and disk space) to run Ptolemy ?  
There also is a PD Matlab -> C++ translator available that I have used in  
the past. It has a shell that allows you to use the regular Matlab  
interpreter, when you get your code working, translate it to C++ and it is  
then an executable instead of interpreted.

>

>

>I have made channel simulators for the HF channel (Watterson modell)  
>running under ptolemy. Currently I'm analysing different OFDM systems  
>(frequency and time differential modulation).

>

>

>BTW my realtime HF channel simulator is running! One of our  
>students did it as his final project. The simulator is running on a DSPCOM  
>(40MHz TMS320c26). It should run on the c26-EVM board with some  
>small changes. I hope I can post the sources (after some small  
>changes) to the ftp-site.

>

This is fantastic news! Congratulations - we are looking forward to see how  
it works.

I assume this is the Rayleigh fading model, have you given any thought yet  
to the Markovian impulse noise model that follows the Rayleigh fading?

>

>73' Alexander

>

>

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>*-----+-----*
>|      Alexander F. Kurpiers      |
>| Institut f. Uebertragungstechnik | Voice: +49-6151-162369 |
>|   u. Elektroakustik             | Fax  : +49-6151-165545 |
>| Merckstrasse 25                  | EMail: a.kurpiers@uet.th-darmstadt.de |
>| D-64283 Darmstadt (Germany)     | Hamradio: dl8aau@db0zdf.#rpl.deu.eu |
>*-----+-----*
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>

>

73's,

--Johan, KC7WW

From jalocha@home.ifj.edu.pl Fri Dec 15 06:16:25 1995  
Received: from home-gate.ifj.edu.pl (home-gate.ifj.edu.pl [192.86.14.17]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id GAA18924 for <hfsig@tapir.org>; Fri, 15 Dec 1995 06:15:43 -0600 (CST)  
Received: from home.ifj.edu.pl by home-gate.ifj.edu.pl (JNOS1.101) with SMTP id AA4338 ; Fri, 15 Dec 95 12:15:50 UTC  
Date: Fri, 15 Dec 95 12:54:19 MET  
From: "Pawel Jalocha" <jalocha@home.ifj.edu.pl>  
Message-ID: <1336.jalocha@home.ifj.edu.pl>  
To: dsp4@nic.funet.fi, hfsig@tapir.org  
Reply-to: jalocha@home-gate.ifj.edu.pl  
Subject: BPSK or DBPSK ?

Which modulation scheme is better: straight BPSK or differential BPSK ?  
>From some discussion in the past the conclusion was that a differential phase keying scheme is always worse by 3 dB because you rely on two successive symbols and both of them are being affected by noise thus the difference contains twice as much noise.  
However I often see sentences saying that differential BPSK is better because the the difference between the two states is greater from the distance of a single state from base (zero).

Or does it depend on the demodulator type ?  
I naively make a dot product of two successive I/Q vector  
- is there a better way ?

A related question which is bothering me: is there any S/N advantage by doing the Manchester encoding before applying the data to the BPSK modulator like they do in the 400 bps telemetry ?  
Surely the signal's spectrum becomes twice as wide, does this gain any S/N ?

The 1200 bps BPSK modem for satellites is almost ready.  
Pauli Jeskanen has done lot of tests and he adjusted some paramaters.  
Some bugs/features have been found and corrected on the way.  
Yesterday the modem seemed to transmit and receive right.  
Some more cosmetic changes and the modem is ready.  
The modem seems to perform at least as good as the JAS-1 modem (but I have no idea how good the JAS-1 is).

The satellite modem for for the DSPCARD4/EVM56K can be used for other bands/modes for example for the HF, and it can be scaled down to 600 or 300 bps. One good test I was thinking about is to compare how the 300 bps HF packet performs with BPSK (my modem) and FSK (an ordinary TNC).

Pawel

From gc@fox.cen.com Fri Dec 15 09:01:50 1995  
Received: from uu5.psi.com (uu5.psi.com [38.145.226.3]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id JAA27130 for <hfsig@tapir.org>; Fri, 15 Dec 1995

09:01:44 -0600 (CST)

Received: from fox.cen.com by uu5.psi.com (5.65b/4.0.071791-PSI/PSINet) via SMTP;  
id AA05408 for hfsig@tapr.org; Fri, 15 Dec 95 10:01:29 -0500

Received: by cen.com (4.1/SMI-4.1)  
id AA04128; Fri, 15 Dec 95 10:01:15 EST

Date: Fri, 15 Dec 95 10:01:15 EST  
From: gc@fox.cen.com (Gary Chatters)  
Message-Id: <9512151501.AA04128@cen.com>  
To: hfsig@tapr.org  
Subject: Book recommendation sought

Hello everyone,

I have been reading this list for a few weeks now. It is one of the more interesting maillists available through Internet.

I am hoping that someone can recommend one or two good books on digital data communications that I could read to get better understanding of the topics discussed here. There are probably many books on the subject, but only a few would likely be well written and have a good coverage of all the basic information. The book should cover things like generation and detection of various modulation schemes (FSK, PSK, QPSK,...). Error correction coding would be interesting, too, but that might be another book.

About a week ago in response to a query about M-ary FSK  
Phil Karn wrote:

>

>A few good references are Digital Communications by Proakis (the 3rd edition  
>just came out) and my personal favorite, Digital Modulation and Coding by  
>Wilson (also brand new).

>

Perhaps this is the answer to my question right there. Or are these books rather specialized? Any other recommendations?

Note: Basic math, at least through differential equations, complex variables, etc. is not a problem. (I haven't got wavelets figured out yet though :-)).

BTW, do you people do any regular on the air HF activity?

TNX ES 73,

Gary

From wd5ivd@tapr.org Fri Dec 15 10:35:54 1995  
Received: (from wd5ivd@localhost) by sys1.tapr.org (8.7.2/8.7.2) id KAA03561 for hfsig@tapr.org; Fri, 15 Dec 1995 10:35:53 -0600 (CST)  
From: Greg Jones <wd5ivd@tapr.org>  
Message-Id: <199512151635.KAA03561@sys1.tapr.org>  
Subject: Re: [HFSIG:754] Book recommendation sought  
To: hfsig@tapr.org

Date: Fri, 15 Dec 1995 10:35:52 -0600 (CST)  
In-Reply-To: <9512151501.AA04128@cen.com> from "Gary Chatters" at Dec 15, 95  
09:09:05 am  
X-Mailer: ELM [version 2.4 PL24]  
Content-Type: text

TAPR will be publishing a book by Tom McDermott entitled "Digital Radio Communications: Design and Theory." There was a full table of contents printed in the Summer issues of the TAPR PSR I believe.

It should fit exactly what you are looking for from you comments.

Looks like maybe 300 pages, since I am over 150 and only at Chapter 7 of 15.

Cheers - Greg

>  
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>  
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> more interesting maillists available through Internet.  
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>  
> TNX ES 73,  
>  
> Gary  
>

>

From rick@itron-ca.com Fri Dec 15 11:20:27 1995  
Received: from itron-ca.com (gate.itron-ca.com [204.30.20.2]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id LAA06445 for <hfsig@tapir.org>; Fri, 15 Dec 1995 11:20:23 -0600 (CST)  
Received: (from audit@localhost) by itron-ca.com (8.6.9/8.6.9) id JAA26231 for <hfsig@tapir.org>; Fri, 15 Dec 1995 09:19:48 -0800  
Received: from unknown(204.30.20.118) by gate.itron-ca.com via smap (V1.3mjr) id sma026226; Fri Dec 15 09:19:06 1995  
Date: Fri, 15 Dec 95 09:03:56 PST  
From: rick@itron-ca.com  
Subject: RE: [HFSIG:753] BPSK or DBPSK ?  
To: hfsig@tapir.org  
X-Mailer: Chameleon - TCP/IP for Windows by NetManage, Inc.  
Message-ID: <Chameleon.4.01.951215091900.rick@rick.itron-ca.com>  
MIME-Version: 1.0  
Content-Type: TEXT/PLAIN; charset=US-ASCII

Pawel,

1. DBPSK and PSK differ in that errors occur in PAIRS with DBPSK but can occur singly in BPSK. The differential business means that making a mistake in estimating the phase of one bit means the next bit will screw up too since the first bit is the reference for the second bit. Because the errors occur in pairs, however, only implies that the BER for a given SNR is double, this does not imply that the SNR needs to be 3 dB larger in order to get the same error rate! At a BER of .001 the difference amounts to only about a 1 dB loss in SNR and at .00001 the difference is amazingly negligible.
2. DBPSK can be demodulated coherently or non coherently. Non coherent methods require a delay line that is as long as a bit time. The difference between the transmitted carrier and the receiver LO, however, must be stable over a bit time, in other words, the drift of phase of the carrier over the bit time must be small. 10 degrees or so should do it. This gets harder to do as the data rate gets lower and lower which is one of the reasons why DBPSK is often used with high speed microwave links.
3. A popular user of DBPSK is GPS which uses it for the 50 BPS data downlink (if my memory serves me correctly).
4. Manchestered data offers no improvement in SNR, however, it makes bit sync a lot easier (at the expense of 2x the bandwidth as you have noticed). In so far as sync errors degrade detection then Manchesterizing the data is good if it will fit into the bandwidth allocation.



Cheers!

Rick W6NZK

-----  
Rick Booth

'95 900SS SP

E-mail: rick@itron-ca.com  
-----

From forrerj@ucs.orst.edu Fri Dec 15 11:43:59 1995  
Received: from ucs.orst.edu (root@UCS.ORST.EDU [128.193.4.5]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id LAA07485 for <hfsig@tapir.org>; Fri, 15 Dec 1995 11:43:50 -0600 (CST)  
Received: from p09.t0.monrotel.com by ucs.orst.edu; (5.65v3.0/1.1.8.2/24Sep94-1201PM) id AA18156; Fri, 15 Dec 1995 09:43:32 -0800  
Message-Id: <9512151743.AA18156@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Fri, 15 Dec 1995 09:48:27 -0800  
To: hfsig@tapir.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: Re: [HFSIG:754] Book recommendation sought

Hi Gary,

Welcome to HFSIG. Glad you found us.

>Hello everyone,

>

>I have been reading this list for a few weeks now. It is one of the  
>more interesting maillists available through Internet.

>

>I am hoping that someone can recommend one or two good books on  
>digital data communications that I could read to get better understanding  
>of the topics discussed here. There are probably many books on the  
>subject, but only a few would likely be well written and have a  
>good coverage of all the basic information. The book should cover  
>things like generation and detection of various modulation schemes  
>(FSK, PSK, QPSK,...). Error correction coding would be interesting, too,  
>but that might be another book.

>

>About a week ago in response to a query about M-ary FSK

>Phil Karn wrote:

>>

>>A few good references are Digital Communications by Proakis (the 3rd edition  
>>just came out) and my personal favorite, Digital Modulation and Coding by  
>>Wilson (also brand new).

>>

>

>Perhaps this is the answer to my question right there. Or are these  
>books rather specialized? Any other recommendations?

I suppose you will get a number of good suggestions from the group. The following three books have been quite useful to me - I picked them up at our local used bookstore:

1) Digital Communications Fundamentals and Applications. Bernard Sklar. Prentice Hall. ISBN 0-13-211939-0 025. Carries a common thread throughout the book - Highly recommended.

2) Telecommunication Transmission Handbook. Third Edition. Roger L. Freeman. Wiley. ISBN 0-471-51816-6. General topics includes theory and a lot of good stuff on the HF channel, different types of modems, coding etc. - much lighter reading.

3) Telecommunication Systems Engineering. Lindsey and Simon. Dover. ISBN 0-486-66838-X. A compendium of the works of these authors. Covers a lot of theory on the mechanics of PSK detection, clock recovery, Costas loops - more than you will ever need to know. No DSP, but heavy reading.

These, however, does not really specialize in DSP techniques, for that topic there are much more specialized literature such as Messerschmidt's book on modem design for example that I just have to mention. It does not take much to realize that this field have become a very involved mish-mash of different disciplines, mathematics being the cornerstone. It also is quite obvious that DSP techniques holds tremendous possibilities for the future.

>

>Note: Basic math, at least through differential equations, complex  
>variables, etc. is not a problem. (I haven't got wavelets figured  
>out yet though :-) ).

>

>BTW, do you people do any regular on the air HF activity?

The Fin's have been doing some innovative testing of OFDM, but things are only just beginning. It's a good time to get your feet wet. I suspect that a lot of interesting things will be happening in the near future.

Keep in touch.

--Johan Forrer, KC7WW

From forrerj@ucs.orst.edu Fri Dec 15 11:44:08 1995

Received: from ucs.orst.edu (root@UCS.ORST.EDU [128.193.4.5]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id LAA07519 for <hfsig@tapir.org>; Fri, 15 Dec 1995 11:44:02 -0600 (CST)

Received: from p09.t0.monrotel.com by ucs.orst.edu; (5.65v3.0/1.1.8.2/24Sep94-1201PM)

id AA18147; Fri, 15 Dec 1995 09:43:49 -0800

Message-Id: <9512151743.AA18147@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Fri, 15 Dec 1995 09:48:44 -0800  
To: hfsig@tapr.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: New PCMCIA DSP module

Hi all,

Thought that I would pass on a tidbit of exciting news. I have no relation with the following company nor do I get any special treatment, just passing on the news.

CAC now manufactures and sells a type 3 PCMCIA DSP module called the Bulletdsp. It is based on the TI320C3x floating point DSP and contains a 16-bit stereo CODEC, SRAM, DRAM, and FLASH memory. The base price of the Bullet is \$895 and comes with 256KB SRAM, 0 DRAM, 128KB flash memory, the 50MHz C32 and the stereo codec. Its part number is Bulletdsp-S2D0F1.

Replacing the -S2 with a -S1 (a \$700 option) increases the SRAM to 1MB.  
Replacing the -D0 with a -D2 (a \$300 option) increases the DRAM to 2MB.  
Replacing the -D0 with a -D4 (a \$600 option) increases the DRAM to 4MB.  
Replacing the -F1 with a -F5 (a \$ 75 option) increases the flash to 512KB.  
The 60MHz version and the PCMCIA type II are not yet available.

The user's manual, which includes the MS-DOS and Windows 3.1 drivers, comes with the Bulletdsp. The software also contains several diagnostic and demo programs, such as audio record/playback and FFT. Socket services software are not provided (this should have been included with your notebook computer.) Refer to the "Programming Interface" for more information about CODEC software that is included with the Bulletdsp.

Any TI C3x C-compiler or assembler works with our board. We offer the TI C-compiler for \$1500, part number TIC32-CDS, and the assembler for \$500, part number TIC32-DS.

For further details, please contact, CAC - Jim Bridges  
(71342.1717@compuserve.com).

Would'nt this module in conjunction with a laptop would make a powerful portable DSP platform?

73's

--Johan Forrer, KC7WW

From rick@itron-ca.com Fri Dec 15 15:33:38 1995  
Received: from itron-ca.com (gate.itron-ca.com [204.30.20.2]) by sys1.tapr.org

(8.7.2/8.7.2) with SMTP id PAA07355 for <hfsig@tapr.org>; Fri, 15 Dec 1995 15:33:29 -0600 (CST)  
Received: (from audit@localhost) by itron-ca.com (8.6.9/8.6.9) id NAA26879 for <hfsig@tapr.org>; Fri, 15 Dec 1995 13:32:55 -0800  
Received: from unknown(204.30.20.118) by gate.itron-ca.com via smap (V1.3mjr) id sma026877; Fri Dec 15 13:32:41 1995  
Date: Fri, 15 Dec 95 13:30:42 PST  
From: rick@itron-ca.com  
Subject: Re: Book recommendation sought  
To: hfsig@tapr.org  
X-Mailer: Chameleon - TCP/IP for Windows by NetManage, Inc.  
Message-ID: <Chameleon.4.01.951215133236.rick@rick.itron-ca.com>  
MIME-Version: 1.0  
Content-Type: TEXT/PLAIN; charset=US-ASCII

Another book that includes both DSP and communications:

Digital Signal Processing Communication Algorithms, Frerking, ISBN 0-442-01616-6

Rick  
W6NZK

-----  
Rick Booth  
'95 900SS SP  
E-mail: rick@itron-ca.com  
-----

From danie.brynard@pixie.co.za Sun Dec 17 23:58:06 1995  
Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapr.org (8.7.2/8.7.2) with ESMTP id XAA01828 for <hfsig@tapr.org>; Sun, 17 Dec 1995 23:57:55 -0600 (CST)  
Received: from net-4.pta.pix.za (net-4.pta.pix.za [196.11.63.140]) by f15.pix.za (8.7.1/8.6.11) with SMTP id HAA02757 for <hfsig@tapr.org>; Mon, 18 Dec 1995 07:58:46 +0200  
Date: Mon, 18 Dec 1995 07:58:46 +0200  
Message-Id: <199512180558.HAA02757@f15.pix.za>  
X-Sender: pak03226@pixie.co.za (Unverified)  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapr.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:741] Re: BPSK modem for 1200 bps

Hi Pawel

Yes I would of course be interested in FEC. I want to learn more about the topic in any way. Are you going to use block codes or convolutional codes ? If you use block codes then one can perhaps do it one the PC side and spare the 56002 the effort ? :-)

You are right about the formula for raised cosine. The formula for root

raised cosine is:

$$h(t) = (4a/\pi \sqrt{T}) * ((\cos(1+a) * \pi t/T) + (T * \sin(1-a) * \pi t/T) / (4at)) / (1 - (4at/T)^2);$$

$a=0$  is the ideal pulse shape.

Hell what a long formula ! Look on p229 of Lee&Messerschmidt of 'Digital Communication'. I am sure there must be a simpler equation ?

Regards, Danie

>>We will have to ask James Miller G3RUH. My documentation says just raised cosine but your are of course right. The root is normally taken.

>

>So what is mathematically the root raised cosine ?

>Is it  $\sin(x)/x$  ?

>

>The other thing is that I would like to know which filter to use

>on the \_receiver\_ side. Suppose the transmitter is raised cosine:

> $0.5 + 0.5 \cos(x)$  for  $x = -\pi \dots \pi$  what should be the receiver's shape ?

>I suspect you need  $\sin(x)/x \dots$  but this one is infinitely long !

>

>Over the weekend I scaled the BPSK modem the other way, down

>to 30 bps. Then I made up a simple terminal interface:

>- pressing Ctrl-T keys the transmitter

>- pressing Ctrl-R releases the PTT

>- any other character gets transmitted on the carrier as a 7-bit ASCII  
> in asynchronous-like format.

>- Any received character is printed on the screen

>

>The signal's bandwidth is some 30 Hz at -6dB and 60 Hz at -50 dB.

>The specific operating feature is that the receiver sweeps its carrier  
>within given margins to find the lock and this takes time...

>for +/- 20 Hz sweep the lock may take 5-15 seconds.

>The transmitting station needs to send that much of idle/dummy  
>information.

>

>If there is some interest I could go on and add some FEC...

>

>Pawel

>

>

From danie.brynard@pixie.co.za Sun Dec 17 23:58:11 1995

Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id XAA01833 for <hfsig@tapir.org>; Sun, 17 Dec 1995 23:58:02 -0600 (CST)

Received: from net-4.pta.pix.za (net-4.pta.pix.za [196.11.63.140]) by f15.pix.za (8.7.1/8.6.11) with SMTP id HAA02755 for <hfsig@tapir.org>; Mon, 18 Dec 1995 07:58:43 +0200

Date: Mon, 18 Dec 1995 07:58:43 +0200

Message-Id: <199512180558.HAA02755@f15.pix.za>

X-Sender: pak03226@pixie.co.za (Unverified)  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapr.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:739] Re: Negative Frequencies

Hi Phil.

Thanks for the answer. I think we are now on the same wavelength :-). My question was regarding a simple-to-calculate routine. To compute arctan in a DSP chip is time consuming or not?

Any way I have found an algorithm that works but it is very sensitive for amplitude variation. If you are interested I will send you the Matlab code. It boils down to something like this:

```
y(t)=r1+jIm1  
y(t+1)=r2+jIm2
```

the sign of the following determine the direction of the phasor:  
 $(\text{Im2} \cdot \text{r1} - \text{Im1} \cdot \text{r2})$ .

One can thus say whether the freq is neg. or pos.

I implemented a FSK demod using it and I could recover the data again but it was very sensitive for input signal strength.

Regards , 73 de danie zs6awk

PS Please note - I am just learning. The things am trying to do have been done countless times by others :-)

>At 11:24 PM 12/1/95 -0600, you wrote:

>

>>y(t)=re1+jim1

>>y(t-1)=re2+jim2

>>

>>Now which way is the phasor turning ? Clockwise or anticlockwise ?

>

>Seems pretty straightforward to me. Assuming no aliasing (an important assumption),

>all you have to do is convert the two samples to polar notation, computing just the angle part since that's all we're interested in here:

>

>phi(t) = atan2(im1,re1)

>phi(t-1) = atan2(im2,re2)

>

>where atan2(y,x) = arctangent(y/x) with automatic quadrant placement. (Many math

>libraries since Fortrash days have this function built in.)

>  
>Now you just subtract the two angles mod  $2\pi$ . If one is, say,  $\pi/2$  larger than  
>you can consider the vector to have rotated in that direction. Of course,  
it's also  
>possible that it rotated  $3\pi/2$  (270 deg) in the opposite direction, which is  
>why it's important to assume no aliasing.  
>  
>Phil  
>  
>

From danie.brynard@pixie.co.za Sun Dec 17 23:58:36 1995  
Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapir.org  
(8.7.2/8.7.2) with ESMTP id XAA01867 for <hfsig@tapir.org>; Sun, 17 Dec 1995  
23:58:28 -0600 (CST)  
Received: from net-4.pta.pix.za (net-4.pta.pix.za [196.11.63.140]) by f15.pix.za  
(8.7.1/8.6.11) with SMTP id HAA02786 for <hfsig@tapir.org>; Mon, 18 Dec 1995  
07:59:22 +0200  
Date: Mon, 18 Dec 1995 07:59:22 +0200  
Message-Id: <199512180559.HAA02786@f15.pix.za>  
X-Sender: pak03226@pixie.co.za (Unverified)  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapir.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:743] Motorola DSP?

Hi

Try this email. This person is the Motorola person for Africa but she will  
be able to tell you who to contact:

Shuba Iyer  
shuba@cad.sun.corp.mot.com

Regards, Danie ZS6AWK

> I'm looking for some General/Technical information about the  
>Motorola DSP 56002EVM. I've searched Motorola's Home Page and found  
>nothing. Thanks!  
>  
>--73's  
>V/R DMP  
>  
>

From matlick@gate.net Mon Dec 18 12:44:25 1995  
Received: from osceola.gate.net (osceola.gate.net [199.227.0.18]) by sys1.tapir.org  
(8.7.2/8.7.2) with SMTP id MAA09932 for <hfsig@tapir.org>; Mon, 18 Dec 1995  
12:44:16 -0600 (CST)  
Received: from matlick.gate.net (sarfl2-43.gate.net [199.227.7.171]) by  
osceola.gate.net (8.6.12/8.6.9) with SMTP id NAA17674 for <hfsig@tapir.org>; Mon,

18 Dec 1995 13:45:00 -0500  
Date: Mon, 18 Dec 1995 13:45:00 -0500  
Message-Id: <199512181845.NAA17674@osceola.gate.net>  
X-Sender: matlick@pop.gate.net  
X-Mailer: Windows Eudora Pro Version 2.1.2  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapr.org  
From: "Allan E. Matlick" <matlick@gate.net>

cancel

-----  
Allan E. Matlick  
4040 Crockers Lake Blvd. 1722  
Sarasota, FL 34238-5543  
Tel: 941-923-7008  
Fax: 941-927-8178  
Internet: matlick@ gate.net  
MSN:Allan\_Matlick@msn.com  
Compuserve: 71630,1561  
-----

From dwborden@ns1.pananet.com Mon Dec 18 16:21:31 1995  
Received: from ns1.pananet.com ([206.33.152.3]) by sys1.tapr.org (8.7.2/8.7.2)  
with SMTP id QAA09986 for <hfsig@tapr.org>; Mon, 18 Dec 1995 16:21:15 -0600 (CST)  
Received: from TARDIS by ns1.pananet.com (NTMail 3.00.06) id aa002170 Mon, 18 Dec  
95 22:23:44 -0400 (EDT)  
Message-ID: <30D5E6E1.6AE2@pananet.com>  
Date: Mon, 18 Dec 1995 17:10:41 -0500  
From: David Wilson Borden <dwborden@ns1.pananet.com>  
X-Mailer: Mozilla 2.0b2 (Windows; I; 32bit)  
MIME-Version: 1.0  
To: hfsig@tapr.org  
Subject: DSP56002EVM  
Content-Type: text/plain; charset=us-ascii  
Content-Transfer-Encoding: 7bit

The Product Brief for the 24-Bit DSP56002 Evaluation Module  
is available free from Motorola. If you get to the Motorola  
DSP Home Page, you can follow to the literature ordering form  
and order the following:

DSP56002EVMP/D Rev.1

It describes the EVM in enough detail to convince you that you  
need it.

> I'm looking for some General/Technical information about the  
> Motorola DSP 56002EVM. I've searched Motorola's Home Page and found  
> nothing. Thanks!

>

>--73's

>V/R DMP

>

>



From mcdermot@rdxsunhost.aud.alcatel.com Tue Dec 19 10:16:56 1995  
 Received: from aud.alcatel.com (rockdal.aud.alcatel.com [128.251.30.1]) by  
 sys1.tapir.org (8.7.2/8.7.2) with SMTP id KAA23452 for <hfsig@tapir.org>; Tue, 19  
 Dec 1995 10:16:50 -0600 (CST)  
 Received: from rdxsunhost.aud.alcatel.com.Aud.Alcatel.COM by aud.alcatel.com (4.1/  
 SMI-4.1)  
 id AA25166; Tue, 19 Dec 95 10:16:17 CST  
 Received: from eagle.aud.alcatel.com by rdxsunhost.aud.alcatel.com.Aud.Alcatel.COM  
 (4.1/SMI-4.1)  
 id AA10074; Tue, 19 Dec 95 10:16:15 CST  
 Received: by eagle.aud.alcatel.com (4.1/SMI-4.1)  
 id AA02275; Tue, 19 Dec 95 10:16:15 CST  
 Date: Tue, 19 Dec 95 10:16:15 CST  
 From: mcdermot@rdxsunhost.aud.alcatel.com (Tom Mcdermott)  
 Message-Id: <9512191616.AA02275@eagle.aud.alcatel.com>  
 To: hfsig@tapir.org  
 Subject: Re: [HFSIG:761] Re: Negative Frequencies

> Thanks for the answer. I think we are now on the same wavelength :-) My  
 > question was regarding a simple-to-calculate routine. Too compute arctan in  
 > a DSP chip is time consuming or not ?  
 >  
 > Any way I have found an algorithm that works but it is very sensitive for  
 > amplitude variation. If you are interested I will send you the Matlab code.  
 > It boils down to something like this:  
 >  
 >  $y(t) = r1 + jIm1$   
 >  $y(t+1) = r2 + jIm2$   
 >  
 > the sign of the following determine the direction of the phasor:  
 >  $(Im2 * r1 - Im1 * r2)$ .  
 >  
 > One can thus say whether the freq is neg. or pos.  
 >

Danie: I think that your formula may be correct - at least it seems  
 to work on a few examples. In general, the cross-product of two vectors  
 should  
 indicate the direction of rotation about the origin from one vector to the  
 other.  
 Thus, if we let  $y(t) = V1$  (vector one) and  $y(t+1) = V2$ , then

$V3 = V1 \times V2$                       where  $V3$  is the cross-product of the two  
 vectors.

Then the direction that  $V3$  points should indicate the direction of rotation.  
 Since  $V3$  should be normal to the (re,im) plane, it should be possible to take  
 the  
 sign of  $V3$  as indicative of the direction of rotation. Now, it's been 24  
 years

since I last did any of this stuff (in physics at UC Berkeley) so I'm a bit rusty.

Also, I don't have my physics book handy. Your formula may indeed be the cross-product in the z-axis. Maybe one of the readers will have a better memory than I and can perform the computation. If this is correct, then it is probably efficient to compute.

> I implemented a FSK demod using it and I could recover the data again but it  
> was very sensitive for input signal strength.

>

> Regards , 73 de danie zs6awk

>

> PS Please note - I am just learning. The things am trying to do have been  
> done countless times by others :-)

We are all (still) learning!

- Tom, N5EG

```
-----+-----
Tom McDermott                | "All opinions expressed
Alcatel Network Systems, Inc. | are my own, and do not
mcdermot@aud.alcatel.com      | represent those of Alcatel
[ ICC'96 Technical Program Secretary ] | Network Systems, Inc."
[ June 23-27, 1996, Dallas, Tx. ] |
-----+-----
```

From karn@qualcomm.com Tue Dec 19 20:15:13 1995  
Received: from servo.qualcomm.com (servo.qualcomm.com [129.46.128.14]) by  
sys1.tapir.org (8.7.2/8.7.2) with ESMTP id UAA18347 for <hfsig@tapir.org>; Tue, 19  
Dec 1995 20:15:11 -0600 (CST)  
Received: (from karn@localhost) by servo.qualcomm.com (8.7.2/8.7.2/1.3) id  
SAA16678; Tue, 19 Dec 1995 18:14:37 -0800 (PST)  
Date: Tue, 19 Dec 1995 18:14:37 -0800 (PST)  
From: Phil Karn <karn@qualcomm.com>  
Message-Id: <199512200214.SAA16678@servo.qualcomm.com>  
To: hfsig@tapir.org  
In-reply-to: <1336.jalocha@home.ifj.edu.pl>  
Subject: Re: [HFSIG:753] BPSK or DBPSK ?

>Which modulation scheme is better: straight BPSK or differential BPSK ?

Coherently demodulated BPSK is always better than differentially decoded PSK. Assuming, that is, you have a perfect carrier phase reference at the receiver. The whole reason for using DPSK is to avoid the need for such a reference, either because it's too hard to build one or because the channel phase characteristics are so unstable (e.g., Rayleigh fading) that carrier phase extraction is not practical.

The penalty for DPSK vs BPSK depends on the S/N. At high S/N ratios the two are nearly indistinguishable because there is little noise on the "reference" signal, so DPSK performs much like BPSK with a good reference. At low S/N ratios the curves diverge because of the noisy "reference". (Of course, a practical BPSK system will also diverge from ideal because it too will have an imperfect phase reference).

>A related question which is bothering me: is there any S/N advantage by doing  
>the Manchester encoding before applying the data to the BPSK modulator  
>like they do in the 400 bps telemetry ?  
>Surely the signal's spectrum becomes twice as wide, does this gain any S/N ?

Offhand I'd say this has no effect on S/N as long as matched filter detection is used in both cases. The two Manchester signal states are still antipodal.

It's easy to see this with a little thought. You can produce Manchester encoding of a baseband modulated BPSK signal by simply multiplying it again by a square wave at the data rate. And you can undo this at the receiver by multiplying again by the same square wave signal. Assuming perfect phasing of the square wave signal, the demodulator wouldn't even know it was there. The performance is exactly the same in either case.

It's like direct sequence PN spreading, which has no effect on the S/N requirements as long as the channel is linear and the demodulators are all ideal matched filters. In fact, Manchester *IS* direct sequence spreading, only the "spreading sequence" is just two chips long, repeats on every data bit, and consists of the pattern 01010101....

Phil

From karn@qualcomm.com Tue Dec 19 20:29:20 1995  
Received: from servo (servo.qualcomm.com [129.46.128.14]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id UAA18964 for <hfsig@tapir.org>; Tue, 19 Dec 1995 20:29:18 -0600 (CST)  
Received: (from karn@localhost) by servo (8.7.2/8.7.2/1.3) id SAA16689; Tue, 19 Dec 1995 18:28:40 -0800 (PST)  
Date: Tue, 19 Dec 1995 18:28:40 -0800 (PST)  
From: Phil Karn <karn@qualcomm.com>  
Message-Id: <199512200228.SAA16689@servo>  
To: hfsig@tapir.org  
In-reply-to: <9512151501.AA04128@cen.com> (gc@fox.cen.com)  
Subject: Re: [HFSIG:754] Book recommendation sought

>>

>>A few good references are Digital Communications by Proakis (the 3rd edition  
>>just came out) and my personal favorite, Digital Modulation and Coding by  
>>Wilson (also brand new).

>Perhaps this is the answer to my question right there. Or are these  
>books rather specialized? Any other recommendations?

These books are both written for a senior or graduate level digital communications theory course. They're at about the same level, though I find Wilson somewhat easier to read.

Phil

From mcdermot@rdxsunhost.aud.alcatel.com Wed Dec 20 08:16:20 1995  
Received: from aud.alcatel.com (rockdal.aud.alcatel.com [128.251.30.1]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id IAA17032 for <hfsig@tapir.org>; Wed, 20 Dec 1995 08:16:17 -0600 (CST)  
Received: from rdxsunhost.aud.alcatel.com.Aud.Alcatel.COM by aud.alcatel.com (4.1/SMI-4.1)  
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id AA08605; Wed, 20 Dec 95 08:15:43 CST  
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id AA02556; Wed, 20 Dec 95 08:15:42 CST  
Date: Wed, 20 Dec 95 08:15:42 CST  
From: mcdermot@rdxsunhost.aud.alcatel.com (Tom Mcdermott)  
Message-Id: <9512201415.AA02556@eagle.aud.alcatel.com>  
To: hfsig@tapir.org  
Subject: Re: Negative Frequencies

Danie: as a follow-up to yesterday's message I broke out the freshman physics book, and here's the derivation of the formula:

Assume two vectors, A and B. Define the vector A (in 3-dimensions) as follows:

$$A = a_x X + a_y Y + a_z Z$$

where X, Y, and Z are the three directions on the coordinate system.  $a_x$  is the component of vector A in the X direction,  $a_y$  is the component in the Y direction, and  $a_z$  is the component in the Z direction. We'll assign X to be the real axis, Y to be the imaginary axis, and Z to be normal to X and Y (Z points out of the page formed by the real, imaginary plane. In the right-handed coordinate system, X goes from center to the right, Y goes from the center up the page, and Z comes out of the page towards the reader.

Assuming positive frequency, then vector A (at time t) rotates to position B (at time t+1) by making counter-clockwise rotation.

Then we form the two signals at time (t) and time (t+1) and assign each to vector A and B, respectively. Assume that (re1,im1) is at time (t) and (re2,im2) is at time (t+1), then:

$$\begin{aligned} A &= \text{re1 } X + \text{im1 } Y + 0 Z \\ B &= \text{re2 } X + \text{im2 } Y + 0 Z \end{aligned}$$

Note that there is no component of either vector in the Z axis, so that part is zero.

Let vector  $C = A \times B$  (C equals A cross B).

$C = c_x X + c_y Y + c_z Z$

Then it can be shown that the three component parts of C are:

$c_x = a_y b_z - a_z b_y$

$c_y = a_z b_x - a_x b_z$

$c_z = a_x b_y - a_y b_x$

Since we know that  $a_z$  and  $b_z$  are both zero, then  $c_x$  and  $c_y$  must both be zero, leaving only the  $c_z$  term. Thus the cross-product vector is normal to the re,im plane (as I correctly remembered yesterday). When  $A \rightarrow B$  rotates counter-clockwise, the Z axis term will be positive. IE: +Z equals positive when the frequency is positive, and is negative when frequency is negative.

Translating  $a_x$ ,  $b_y$ ,  $a_y$ ,  $b_z$  to the real and imaginary parts yields:

$c_z = \text{re1 im2} - \text{im2 re1}$

This checks with the formula that you presented, and so your formula is correct. A couple of notes:

The magnitude of  $A \times B$  is  $AB \sin(\theta)$ . Thus when the angle between the two vectors approaches zero or approaches 180 degrees, the cross product goes to zero. Also, when the vector travels more than 180 degrees between time samples, the sign reverses, so that it appears to be negative frequency. This means that the nyquist sampling theorem must be satisfied. Thirdly, this only applies to narrowband signals, not broadband signals, whose time shape does not bear the direct relationship.

Thanks for the interesting exercise, Danie. My knowledge of the subject has been increased significantly by this discussion. Good luck with your project.

- Tom, N5EG

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Tom McDermott                | "All opinions expressed
Alcatel Network Systems, Inc. | are my own, and do not
mcdermot@aud.alcatel.com     | represent those of Alcatel
[ ICC'96 Technical Program Secretary ] | Network Systems, Inc."
[ June 23-27, 1996, Dallas, Tx. ] |
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From jra1854@tntech.edu Wed Dec 20 15:27:25 1995

Received: from tntech.edu (SYSTEM@gemini.tntech.edu [149.149.11.7]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id PAA04753 for <hfsig@tapir.org>; Wed, 20 Dec 1995 15:27:20 -0600 (CST)

Received: from [149.149.42.11] ("port 1441"@cookie-monster.ee.tntech.edu) by tntech.edu (PMDF V5.0-5 #11446) id <01HZ1A0B1P8W9D6JGW@tntech.edu> for hfsig@tapir.org; Wed, 20 Dec 1995 15:26:47 -0600 (CST)

Date: Wed, 20 Dec 1995 15:26:46 -0600

From: jra1854@tntech.edu (Jeffrey Austen)

Subject: Re: BPSK or DBPSK ?

X-Sender: jra1854@gemini.tntech.edu

To: hfsig@tapir.org

Message-id: <v01530500acf737cab3af@[149.149.42.11]>

MIME-version: 1.0

Content-type: text/plain; charset="us-ascii"

Content-transfer-encoding: 7BIT

>Which modulation scheme is better: straight BPSK or differential BPSK ?  
>>From some discussion in the past the conclusion was that a differential  
>phase keying scheme is always worse by 3 dB because you rely on two

There are two effects, differential signaling and differentially coherent demodulation, at work.

Differential signaling doubles the error rate. As receiver takes the difference between the previous bit and the current bit, one error in the channel results in an two errors at the output. In a typical system, at low error rates, this results in a fraction of a dB worse performance.

Differentially coherent detection also degrades the performance. For a binary system the degradation at low error rates is a little less than 1 dB. In an M-ary system the degradation approaches 3 dB for large M.

An excellent reference is "Digital Communication Techniques: Signal Design and Detection" by Marvin K. Simon, Sami M. Hinedi, and William C. Lindsey, Prentice-Hall, 1995. Although this book is written for the graduate student and communications professional, there are useful results that will be of interest to some of the people on this mailing list. In particular, it devotes five chapters (almost 400 pages) to the analysis of various receiver structures: coherent, noncoherent, partially coherent, differentially coherent and double differentially coherent. Among these results one can find the exact answer to the question posed above as well as to quite a few related questions.

Jeff, k9ja

---

Jeffrey Austen		Tennessee Technological University
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+1 615 372 3485		Cookeville Tennessee 38505 U.S.A.

From gc@fox.cen.com Wed Dec 20 17:25:27 1995

Received: from uu5.psi.com (uu5.psi.com [38.145.226.3]) by sys1.tapir.org



optimal as a FSK demod. The best FSK demodulator is still a bank of correlators where you integrate the energy for each tone over a bit interval and then pick the strongest.

Phil

From LAITINEN@ESHOP.UOREGON.EDU Thu Dec 21 20:52:31 1995  
Received: from ESHOP.UOREGON.EDU (eshop.uoregon.edu [128.223.94.14]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id UAA14495 for <hfsig@tapir.org>; Thu, 21 Dec 1995 20:52:23 -0600 (CST)  
Date: Thu, 21 Dec 1995 18:52:42 -0800 (PST)  
From: LAITINEN@ESHOP.UOREGON.EDU  
Message-Id: <951221185242.cb5@ESHOP.UOREGON.EDU>  
Subject: RE: [HFSIG:770] Re: BPSK or DPBSK ?  
To: hfsig@tapir.org  
X-Vmsmail-To: SMTP%"hfsig@tapir.org"

>Concerning the discussion on BPSK vs. DBPSK:

>

>>

>> Differential signaling doubles the error rate. As receiver takes the  
>> difference between the previous bit and the current bit, one error in the  
>> channel results in an two errors at the output. In a typical system, at  
> ^^^^^^^

>> low error rates, this results in a fraction of a dB worse performance.  
> ^^^^^^^^^^^^^^^^^^^

>

>What type of a link is expected for HF? This statement surprised me  
>a bit, because I think of typical HF links as having to work at low SNR  
>(or at least quite variable SNR) and thus high BER.

More importantly, it seems to me, is the multi-path induced phase jitter.  
Many times, particularly on the lower HF freqs, I have experienced links  
with excess SNR (above that which is needed for a low BER) behave poorly  
with Clover due to excessive multi-path distortion.

>

>I have not been on this list long enough to know what kind of  
>link people expect to work with. My HF experience is limited  
>to CW and RTTY. Signals on RTTY can have good SNR, but you would  
>like a system to work to as low an SNR as possible.

>

>Gary

>

Does anyone have experience with HAL's PCI-4000/M in the Clover and FSK modes? HAL's DSP implementation of FSK filters on the PCI-4000/M seems to be lacking. In my comparisons with the PK-232, e.g., it generally performs poorly. The PK-232 is not a particularly good reference model! My 35 year old vacuum tube TU performs better than



the PK-232 on 45 Baud RATT.

Clover performs well as long as the multi-path distortion is low. Unfortunately, this is often not the case on the lower frequencies -- especially in the summer on short-skip circuits. Thus even with high SNR (>40 dB), Clover is often stuck in its lowest modulation mode for linked circuits (BPSM at 8 to 12 chars/sec depending on the ECC coding rate/efficiency). HAL, unfortunately, has not been able to take advantage of circuits with high SNR to at least partially overcome mutli-path distortion limitations when operating Clover.

Larry  
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From forrerj@ucs.orst.edu Fri Dec 22 12:48:58 1995  
Received: from ucs.orst.edu (root@UCS.ORST.EDU [128.193.4.5]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id MAA17491 for <hfsig@tapir.org>; Fri, 22 Dec 1995 12:48:54 -0600 (CST)  
Received: from p01.t0.monrotel.com by ucs.orst.edu; (5.65v3.2/1.1.8.2/24Sep94-1201PM)  
id AA00312; Fri, 22 Dec 1995 10:48:41 -0800  
Message-Id: <9512221848.AA00312@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Fri, 22 Dec 1995 10:50:59 -0800  
To: hfsig@tapir.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: Re: [HFSIG:772] Re: BPSK or DPBSK ?

Hi Larry,

I think we had a QSO or two on 2 meters in the past - glad to see you on HFSIG.

>  
>  
>  
>>Concerning the discussion on BPSK vs. DBPSK:  
>>  
>>>  
>>> Differential signaling doubles the error rate. As receiver takes the  
>>> difference between the previous bit and the current bit, one error in the  
>>> channel results in an two errors at the output. In a typical system, at  
>>> low error rates, this results in a fraction of a dB worse performance.  
>> ^^^^^^^^^^^^^^^^^  
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>with Clover due to excessive multi-path distortion.

>

>>

>>I have not been on this list long enough to know what kind of  
>>link people expect to work with. My HF experience is limited  
>>to CW and RTTY. Signals on RTTY can have good SNR, but you would  
>>like a system to work to as low an SNR as possible.

>>

>>Gary

>>

>

>Does anyone have experience with HAL's PCI-4000/M in the Clover and  
>FSK modes? HAL's DSP implementation of FSK filters on the PCI-4000/M  
>seems to be lacking. In my comparisons with the PK-232, e.g., it  
>generally performs poorly. The PK-232 is not a particularly good  
>reference model! My 35 year old vacuum tube TU performs better than  
>the PK-232 on 45 Baud RATT.

I cannot help here as I have not had the opportunity to play with a  
PCI-4000/M. I have heard that HAL have made improvements to their RTTY  
filters to bring their performance on par with the competition. With the  
hardware on their boards, I don't see any reason why the software cannot be  
made to equal or better our usual RTTY benchmark modems

However, a few thoughts: Clover uses a four-tone ensamble that is engineered  
for extremely compact and narrow bandwidth. This narrow bandwidth, however,  
does not come without penalties and perhaps is the price you have to pay on  
the long run. 80m, and 40m at times, has extreme cases of multipath. This  
effect, as we know, plays havoc on absolute phase relationships also  
includes doppler-effects. The only possible guard against these adverse  
affects is redundancy - Clover at its lowest data rate makes an attempt to  
implement redundancy in two ways: 1) by using the four tones redundantly  
(they all carry the same information), 2) hope that the Reed-Solomon ECC  
will be effective. At this low rate Clover effectively uses a signaling rate  
of approximately 31 baud, which, in theory at least, should allow DBPSK to  
work. It thus remains a question whether the Clover demodulator does a good  
job of using diversity principles. In other words, does it still use  
narrow-band techniques for each of the four tones and whether that is a good  
idea is questionable - perhaps this is what you are alluding to in your  
camparisons to older tube-type technology. There the situation is a bit  
different, i.e., much wider bandwidth filters that are most forgiving.

>

>Clover performs well as long as the multi-path distortion is low.  
>Unfortunately, this is often not the case on the lower frequencies --  
>especially in the summer on short-skip circuits. Thus even with  
>high SNR (>40 dB), Clover is often stuck in its lowest modulation  
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>ECC coding rate/efficiency). HAL, unfortunately, has not been able

>to take advantage of circuits with high SNR to at least partially  
>overcome mutli-path distortion limitations when operating Clover.  
>  
>Larry  
>WA6JYJ/7  
>laitinen@eshop.uoregon.edu  
>  
>

Season's Greetings and 73's,

--Johan, KC7WW

P.S. I'll be out of the woods by January 8th and will be participating more actively.

From LAITINEN@ESHOP.UOREGON.EDU Fri Dec 22 14:41:58 1995  
Received: from ESHOP.UOREGON.EDU (eshop.uoregon.edu [128.223.94.14]) by  
sys1.tapir.org (8.7.2/8.7.2) with SMTP id OAA21065 for <hfsig@tapir.org>; Fri, 22  
Dec 1995 14:41:52 -0600 (CST)  
Date: Fri, 22 Dec 1995 12:42:42 -0800 (PST)  
From: LAITINEN@ESHOP.UOREGON.EDU  
Message-Id: <951222124242.d51@ESHOP.UOREGON.EDU>  
Subject: RE: [HFSIG:773] Re: BPSK or DPBSK ?  
To: hfsig@tapir.org  
X-Vmsmail-To: SMTP%"hfsig@tapir.org"

Johan:

FB. Yes, I operate two meters and travel up to OSU every couple of months.  
So we have probably yakked before on one of the repeaters, possibly  
the Vineyard Mtn repeater...

Yes, HAL improved the DSP FSK filters in the PCI-4000/M. The first release  
of the /M upgrade was so bad it was essentially unusable. The next release  
(and I'm going by memory here, so I may not have it quite right) made for  
usable RATT/Amtor. But performance was poor. I think the Pactor came out  
in this release and was essentially unusable. The last release that I  
got brought the RATT mode up to what I originally thought was on par or  
better than the PK-232. Bugs fixed in the Pactor protocol implementation  
made it useful! Seems to work real well. But more work with the RATT  
mode at my station showed that the PK-232 still outperforms the HAL  
PCI-4000/M under various conditions. Often times the PK-232 yielded  
solid copy while the PCI-4000/M was struggling...

So I'm wondering if others have experienced similar results or if I'm the  
lone ranger???

My comparisons with 1960's technology were between the PK-232 and my  
vintage W6NRM Mark IV-2 TU with slideback detectors. The Mark IV-2 does  
a much better job on 45 Baud RATT than does the PK-232. The Mark IV-2  
was designed for 45-Baud while the PK-232 has much wider bandwidth...

Then there are the ancient slide-back detectors...

As for the Clover mode on the PCI-4000/M: I've had numerous discussions and correspondence with Bill Henry of HAL and Ray Petit about the Clover performance vs SNR and PHS (multipath/phase dispersion). It has been clear from the beginning that Bill wants to go fast under near ideal conditions and does not care much about poor signal conditions. His business considerations (marketing) are the primary reasons for this. Speed, like sex, sells...

My experience also shows that Kantronics' G-TOR often yields about the same net throughput as Clover for similar conditions. Yet the symbol rate for G-TOR is much higher than that of Clover. Although Clover has a much lower symbol rate and in principle should tolerate multi-path better than higher symbol rate systems, this does not always appear to be the case. Perhaps HAL's choice of modulation based on SNR vs PHS transition points is too conservative.

Your point about bandwidth is well taken. Bill points to that with considerable pride. Obviously G-TOR using BFSK with the usual implementation has a lousy spectrum -- especially compared to Clover.

So I guess the bottom line for me is that I like Clover very much. I just wish that it would do better under medium (typical 80 meter) multi-path conditions. I hate being stuck in the lowest (BPSM) mode! I have suggested to HAL & Co the exploitation of excess SNR to improve the throughput under high PHS conditions. Bill was not receptive at all.

To recover his development cost he appeared to me (a couple of years ago) to be mainly interested in the FEMA/military/gov't/commercial market for Clover. Where one has point-to-point circuits with rhombics/lpa antennas running 10-KW, etc. HAL vs FEMA did some tests between Boulder vs WashDC with such equipment and had those puppies running fairly consistently at the 16P4A (highest speed) mode (about 750 bits/sec before the R-S coding overhead). That is 16 phase shift levels and 4 amplitude shift levels. I believe this was done up around 12-MHz -- a lot different propagation than what I see on 80 meters!

It may be that I am unrealistic in thinking that excess SNR can be used to overcome multi-path problems. Ray did some tests on this a year or so ago and the results were not very good. More work needs to be done on this I think...

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From JRA1854@tntech.edu Fri Dec 22 17:38:26 1995  
Received: from tntech.edu (gemini.tntech.edu [149.149.11.7]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id RAA27532 for <hfsig@tapir.org>; Fri, 22 Dec 1995 17:38:20 -0600 (CST)  
Received: from tntech.edu by tntech.edu (PMDF V5.0-5 #11446)  
id <01HZ46K3GMOW9FMUWS@tntech.edu> for hfsig@tapir.org; Fri,

22 Dec 1995 17:37:47 -0600 (CST)  
Date: Fri, 22 Dec 1995 17:37:47 -0600 (CST)  
From: Jeffrey Austen <JRA1854@tntech.edu>  
Subject: Re: [HFSIG:770] Re: BPSK or DBPSK ?  
To: hfsig@tapr.org  
Message-id: <01HZ46K3J1HU9FMUWS@tntech.edu>  
X-VMS-To: IN%"hfsig@tapr.org"  
MIME-version: 1.0  
Content-type: TEXT/PLAIN; CHARSET=US-ASCII  
Content-transfer-encoding: 7BIT

> > Differential signaling doubles the error rate. As receiver takes the  
> > difference between the previous bit and the current bit, one error in the  
> > channel results in an two errors at the output. In a typical system, at  
> ^^^^^^^  
> > low error rates, this results in a fraction of a dB worse performance.  
> ^^^^^^^^^^^^^^^^^^^  
>  
> What type of a link is expected for HF? This statement surprised me  
> a bit, because I think of typical HF links as having to work at low SNR  
> (or at least quite variable SNR) and thus high BER.

Yes, at HF the error rate would be higher due mainly to interference and  
propagation effects. At higher error rates the performance loss due to  
differential signaling increases. For an example I'll use the equation

$$P_e = \exp(-E_b/N_0)$$

which, althought it may not be exact, it is easy to manipulate and is close  
enough for this purpose. A few results follow:

Pe(original)	Pe(differential)	Eb/No(orig.)	Eb/No(diff.)	Difference(dB)
10^-2	2*10^-2	4.605	3.912	0.71
10^-4	2*10^-4	9.210	8.517	0.34
10^-6	2*10^-6	13.816	13.122	0.22

Jeff, k9ja

+-+

Jeffrey Austen		Tennessee Technological University
jra1854@tntech.edu		Box 5004
(615) 372-3485		Cookeville Tennessee 38505 U.S.A.

From karn@qualcomm.com Fri Dec 22 18:53:02 1995  
Received: from servo.qualcomm.com (servo.qualcomm.com [129.46.128.14]) by  
sys1.tapr.org (8.7.2/8.7.2) with ESMTP id SAA00245 for <hfsig@tapr.org>; Fri, 22  
Dec 1995 18:53:00 -0600 (CST)  
Received: (from karn@localhost) by servo.qualcomm.com (8.7.3/8.7.2/1.3) id  
QAA13697; Fri, 22 Dec 1995 16:52:27 -0800 (PST)  
Date: Fri, 22 Dec 1995 16:52:27 -0800 (PST)  
From: Phil Karn <karn@qualcomm.com>  
Message-Id: <199512230052.QAA13697@servo.qualcomm.com>  
To: hfsig@tapr.org  
In-reply-to: <01HZ46K3J1HU9FMUWS@tntech.edu> (message from Jeffrey Austen on Fri,  
22 Dec 1995 17:45:22 -0600 (CST))  
Subject: Re: [HFSIG:775] Re: BPSK or DBPSK ?

I note that on fading channels where it's difficult to track carrier phase, noncoherently demodulated M-ary orthogonal modulation (e.g., M-ary FSK) with reasonably large values of M provide better  $E_b/N_0$  performance than *any* binary scheme, including coherently demodulated binary PSK, which in turn is better than noncoherent DPSK.

Phil

From danie.brynard@pixie.co.za Fri Dec 22 22:07:08 1995  
Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id WAA05724 for <hfsig@tapir.org>; Fri, 22 Dec 1995 22:06:56 -0600 (CST)  
Received: from net-11.pta.pix.za (net-11.pta.pix.za [196.11.63.147]) by f15.pix.za (8.7.1/8.6.11) with SMTP id GAA13291 for <hfsig@tapir.org>; Sat, 23 Dec 1995 06:08:03 +0200  
Date: Sat, 23 Dec 1995 06:08:03 +0200  
Message-Id: <199512230408.GAA13291@f15.pix.za>  
X-Sender: pak03226@pixie.co.za (Unverified)  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapir.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:768] Re: Negative Frequencies

Thank you TOM for explaining it in such nice and clear terms. I have spoken to many people on the Internet about this problem of mine but I think your explanation is one if the better.

I hope other 'dummies' like me has at least also learned something from the discussion :-)

A merry christmas to all.

Thanks again & 73 de danie zs6awk

>  
>  
> Danie: as a follow-up to yesterday's message I broke out the  
> freshman physics book, and here's the derivation of the formula:  
>  
> Assume two vectors, A and B. Define the vector A (in 3-dimensions)  
> as follows:  
>  
>  $A = a_x X + a_y Y + a_z Z$   
>  
> where X, Y, and Z are the three directions on the coordinate system.  
>  $a_x$  is the component of vector A in the X direction,  $a_y$  is the component  
> in the Y direction, and  $a_z$  is the component in the Z direction.  
> We'll assign X to be the real axis, Y to be the imaginary axis, and  
> Z to be normal to X and Y (Z points out of the page formed by the real,

>imaginary plane. In the right-handed coordinate system,  
>X goes from center to the right, Y goes from the center up the page,  
>and Z comes out of the page towards the reader.  
>  
>Assuming positive frequency, then vector A (at time t) rotates to  
>position B (at time t+1) by making counter-clockwise rotation.  
>  
>Then we form the two signals at time (t) and time (t+1) and  
>assign each to vector A and B, respectively. Assume that (re1,im1)  
>is at time (t) and (re2,im2) is at time (t+1), then:  
>  
>  $A = \text{re1} X + \text{im1} Y + 0 Z$   
>  $B = \text{re2} X + \text{im2} Y + 0 Z$   
>  
>Note that there is no component of either vector in the Z axis, so  
>that part is zero.  
>  
> Let vector  $C = A \times B$  (C equals A cross B).  
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>  $C = c_x X + c_y Y + c_z Z$   
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>Then it can be shown that the three component parts of C are:  
>  
>  $c_x = a_y b_z - a_z b_y$   
>  $c_y = a_z b_x - a_x b_z$   
>  $c_z = a_x b_y - a_y b_x$   
>  
>Since we know that  $a_z$  and  $b_z$  are both zero, then  $c_x$  and  $c_y$  must  
>both be zero, leaving only the  $c_z$  term. Thus the cross-product  
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>remembered yesterday). When  $A \rightarrow B$  rotates counter-clockwise, the  
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>frequency is positive, and is negative when frequency is negative.  
>  
>Translating  $a_x, b_y, a_y, b_z$  to the real and imaginary parts yields:  
>  
>  $c_z = \text{re1} \text{im2} - \text{im2} \text{re1}$   
>  
>This checks with the formula that you presented, and so your formula  
>is correct. A couple of notes:  
>  
> The magnitude of  $A \times B$  is  $AB \sin(\theta)$ . Thus when the  
>angle between the two vectors approaches zero or approaches 180  
>degrees, the cross product goes to zero. Also, when the vector travels  
>more than 180 degrees between time samples, the sign reverses, so that  
>it appears to be negative frequency. This means that the nyquist  
>sampling theorem must be satisfied. Thirdly, this only applies to  
>narrowband signals, not broadband signals, whose time shape does not bear  
>the direct relationship.  
>  
> Thanks for the interesting exercise, Danie. My knowledge of  
>the subject has been increased significantly by this discussion. Good luck  
>with your project.

>  
>  
>  
> - Tom, N5EG  
>  
>  
>-----+-----  
> Tom McDermott | "All opinions expressed  
> Alcatel Network Systems, Inc. | are my own, and do not  
> mcdermot@aud.alcatel.com | represent those of Alcatel  
> [ ICC'96 Technical Program Secretary ] | Network Systems, Inc."  
> [ June 23-27, 1996, Dallas, Tx. ] |  
>-----+-----  
>  
>

From danie.brynard@pixie.co.za Tue Dec 26 06:08:23 1995  
Received: from f15.pix.za (root@f15.pix.za [196.11.62.108]) by sys1.tapir.org  
(8.7.2/8.7.2) with ESMTP id GAA14115 for <hfsig@tapir.org>; Tue, 26 Dec 1995  
06:08:13 -0600 (CST)  
Received: from net-0.pta.pix.za (net-0.pta.pix.za [196.11.63.136]) by f15.pix.za  
(8.7.1/8.6.11) with SMTP id OAA00118 for <hfsig@tapir.org>; Tue, 26 Dec 1995  
14:09:06 +0200  
Date: Tue, 26 Dec 1995 14:09:06 +0200  
Message-Id: <199512261209.OAA00118@f15.pix.za>  
X-Sender: pak03226@pixie.co.za (Unverified)  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapir.org  
From: danie.brynard@pixie.co.za (Danie Brynard)  
Subject: Re: [HFSIG:771] Re: Negative Frequencies

Thanks Phil. How do you know where a bitinterval starts and ends ? I suppose  
one get that info from the bitsync if you have implemented one hey ?

73 Danie

>Danie,  
>  
>This method of looking at phasor rotation is probably not particularly  
>optimal as a FSK demod. The best FSK demodulator is still a bank of  
>correlators where you integrate the energy for each tone over a bit  
>interval and then pick the strongest.  
>  
>Phil  
>  
>

From forrerj@ucs.orst.edu Tue Dec 26 19:00:56 1995  
Received: from ucs.orst.edu (root@UCS.ORST.EDU [128.193.4.5]) by sys1.tapir.org  
(8.7.2/8.7.2) with SMTP id TAA07834 for <HFSIG@tapir.org>; Tue, 26 Dec 1995  
19:00:53 -0600 (CST)



Received: from p08.t0.monrotel.com by ucs.orst.edu;  
(5.65v3.2/1.1.8.2/24Sep94-1201PM)  
id AA30611; Tue, 26 Dec 1995 17:00:42 -0800  
Message-Id: <9512270100.AA30611@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Tue, 26 Dec 1995 17:03:39 -0800  
To: HFSIG@tapr.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: More Pentium DSP Benchmarks

Hi,

I recently received my IAL (Intel Architecture Labs) CDRom, mainly to look at Intel's NSP (native signal processing). For those not familiar with this - it's an attempt to use the main cpu for doing math intensive tasks usually associated with DSP processors. NSP version 2.0 is included on the CDRom - supplied as library code modules for either Microsoft or Borland compiler tools. A comprehensive on-line reference manual and a few DSP applications are also included.

This library may be of interest to amateur radio DSP experimentors and will run on a i386 or higher processor, however, a Pentium will be best for several reasons (it appears to work just fine on my AMD DX4-120, but I have not done any extensive testing). The following benchmarks are shown for a 90 MHz Pentium to illustrate its capabilities:

Function	Time
-----	-----
256 point Complex FFT	256 uS
256 point REal FFT	184 uS
1024 point Complex FFT	1413 uS
1024 pint Real FFT	831 us
512 point Complex Vector multiplication	59 uS
1024 point Complex dot product	321 uS
1024 point Real dot prod.	32 uS
32 tap Complex FIR	5.03 uS
32 tap Real FIR	1.57 uS

(uS=microseconds)  
(Complex=single or double precision floating point numbers)  
(Time computed by repeated calling of the function, i.e., takes into account parameter passing overheads etc.)

These performance figures shows that modest DSP applications can be performed on such a Pentium processor. The included examples on the CDRom shows fairly impressive real-time performance under the Win95/Win NT OS's. Unfortunately, no library source code is supplied. I found it a simple matter to build applications using the supplied libraries using the

Microsoft 32-bit compiler.

Anyone interested in obtaining the CD-ROM may try call Intel at 1-800-253-3696, select option "1" and ask for product code Q495CD (US or Canada only) or 1-503-264-2203 (outside US). This is the IAL developer's network - it's free and comes with a demo version of SPRYs's Web browser and

Adobe Acrobat for browsing the CD's contents.

Hope this is of interest for those brave explorers on HFSIG.

--Johan Forrer, KC7WW

From cn2859@abaco.coastalnet.com Wed Dec 27 18:34:25 1995  
Received: from abaco.coastalnet.com (abaco.coastalnet.com [204.183.40.2]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id SAA23878 for <hfsig@tapir.org>; Wed, 27 Dec 1995 18:34:23 -0600 (CST)  
Received: from by abaco.coastalnet.com (4.1/SMI-4.1) id AB12015; Wed, 27 Dec 95 19:33:19 EST  
Date: Wed, 27 Dec 95 19:33:19 EST  
Message-Id: <9512280033.AB12015@abaco.coastalnet.com>  
X-Sender: cn2859@abaco.coastalnet.com  
X-Mailer: Windows Eudora Light Version 1.5.2  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapir.org  
From: "David M. Gaytko / WD4KPD" <cn2859@abaco.coastalnet.com>  
Subject: Re: [HFSIG:717] BPSK modem for satellites

At 05:05 PM 11/27/95 -0600, you wrote:

>Hi all,

>

>I have made up a 400 bps BPSK modem (for AO-13 telemetry) and I plan to  
>scale it to the 1200 bps version. Is there anybody interrested out there  
>who could verify its operation and compare it against some other designs ?  
>The modem runs on the EVM56K or on the DSPCARD4.

>I will try to make tests with my radio equipment but my only VHF/UHF  
>antenna is omnidirectional thus the satellite signals are rather weak.

>

>Pawel

>=====

==hello, been following your messages about ur psk modem. am a paket  
enthusiast, and want use the psk modem on meteor scatter. would like to hear  
more about ur system, and if it may be available?

tk's & 73's.....david

>

>

From JALOCHA@chopin.ifj.edu.pl Thu Dec 28 05:30:51 1995

Received: from nms.cyf-kr.edu.pl (nms.cyf-kr.edu.pl [149.156.1.3]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id FAA19104 for <hfsig@tapir.org>; Thu, 28 Dec 1995 05:30:44 -0600 (CST)

From: JALOCHA@chopin.ifj.edu.pl  
Received: from CHOPIN.IFJ.EDU.PL (chopin.ifj.edu.pl [192.86.14.9]) by nms.cyf-kr.edu.pl (8.6.11/8.6.11) with SMTP id MAA11091 for <@NMS.CYF-KR.EDU.PL:hfsig@tapir.org>; Thu, 28 Dec 1995 12:10:19 +0100  
Date: Thu, 28 Dec 1995 12:06 GMT+1  
Subject: Re: [HFSIG:780] Re: BPSK modem for satellites  
To: hfsig <@NMS.CYF-KR.EDU.PL:hfsig@tapir.org>  
Message-id: <A5570B3FC02218DC@chopin.ifj.edu.pl>  
X-Envelope-to: @NMS.CYF-KR.EDU.PL:hfsig@tapir.org  
X-VMS-To: IN%"<@NMS.CYF-KR.EDU.PL:hfsig@tapir.org>"

Hello David,

>==hello, been following your messages about ur psk modem. am a paket  
>enthusiast, and want use the psk modem on meteor scatter. would like to hear  
>more about ur system, and if it may be available?

The most recent source you can find at wooster.hut.fi in pub/alefnul/incoming (an FTP site for quick exchange of the DSPCARD4 software).  
The BPSK1200.ASM is a 1200 bps BPSK modem. Its parameters are preset for satellite work but they can be easily modified for simplex mode.

The other file SLOWBPSK.ASM is the 30 bps BPSK modem with ASCII terminal interface.

I don't know which speed you need for meteor scatter ?  
Do meteor tails keep reasonable phase coherency ?  
If not, the FSK with non-coherent demodulator would be a better solution.

Pawel

From karn@qualcomm.com Thu Dec 28 22:00:51 1995  
Received: from servo.qualcomm.com (servo.qualcomm.com [129.46.128.14]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id WAA26528 for <hfsig@tapir.org>; Thu, 28 Dec 1995 22:00:48 -0600 (CST)  
Received: (from karn@localhost) by servo.qualcomm.com (8.7.3/8.7.2/1.3) id UAA08846; Thu, 28 Dec 1995 20:00:12 -0800 (PST)  
Date: Thu, 28 Dec 1995 20:00:12 -0800 (PST)  
From: Phil Karn <karn@qualcomm.com>  
Message-Id: <199512290400.UAA08846@servo.qualcomm.com>  
To: hfsig@tapir.org  
In-reply-to: <199512261209.0AA00118@f15.pix.za> (danie.brynard@pixie.co.za)  
Subject: Re: [HFSIG:778] Re: Negative Frequencies

>Thanks Phil. How do you know where a bitinterval starts and ends ? I suppose  
>one get that info from the bitsync if you have implemented one hey ?

Yeah. Acquiring bit timing is probably exceeded in difficulty only by acquiring carrier phase. But while you can punt on the latter by using

a noncoherent demodulation technique, you really can't avoid the former.

There are many ways discussed in the literature, and the principles are somewhat similar. The job is made somewhat easier than carrier phase acquisition by the much lower frequency of the data rate (as opposed to the RF carrier frequency) and the correspondingly smaller uncertainty due to doppler shift and other distortions. At extremely low data rates you can use a common external reference (e.g., GPS) but only when the propagation delay is small or easily characterized.

Phil

From karn@qualcomm.com Thu Dec 28 22:43:15 1995  
Received: from servo.qualcomm.com (servo.qualcomm.com [129.46.128.14]) by sys1.tapir.org (8.7.2/8.7.2) with ESMTP id WAA28042 for <hfsig@tapir.org>; Thu, 28 Dec 1995 22:43:12 -0600 (CST)  
Received: (from karn@localhost) by servo.qualcomm.com (8.7.3/8.7.2/1.3) id UAA08925; Thu, 28 Dec 1995 20:42:39 -0800 (PST)  
Date: Thu, 28 Dec 1995 20:42:39 -0800 (PST)  
From: Phil Karn <karn@qualcomm.com>  
Message-Id: <199512290442.UAA08925@servo.qualcomm.com>  
To: hfsig@tapir.org  
In-reply-to: <9512270100.AA30611@ucs.orst.edu> (forrerj@ucs.orst.edu)  
Subject: Re: [HFSIG:779] More Pentium DSP Benchmarks

Johan,

This package sounds very interesting. And did I read you correctly that the price is right, i.e., free?

>256 point Complex FFT            256 uS

This seems too good to be true. Sure it's a P90?

I sweat blood to get my own floating point 256-point CFFT down to 335 microseconds on the P90, and that involved doing a radix-4 primitive in assembler that I groveled over for days (rewriting it several times) to keep the FPU pipeline full. And that's without bit reversal, which I kept separate because it can often be avoided in practice (e.g., in fast convolution).

>32 tap Real FIR                   1.57 uS

This seems more realistic. I did a dot product (FIR) that executes in 3 clocks per tap once the pipe fills. This is about as fast as I think it's possible to go on the Pentium given its instruction set -- unless there's a really clever trick I haven't discovered yet.

Phil

From FLundgren@daniel.maf.org Fri Dec 29 08:01:44 1995  
Received: from daniel.maf.org (daniel.maf.org [204.31.147.2]) by sys1.tapir.org

(8.7.2/8.7.2) with ESMTP id IAA17752 for <hfsig@tapr.org>; Fri, 29 Dec 1995 08:01:41 -0600 (CST)  
Received: from gabriel.maf.org (gabriel.maf.org [204.31.147.3]) by daniel.maf.org (8.7.1/95082901) with SMTP id GAA08896 for <hfsig@tapr.org>; Fri, 29 Dec 1995 06:02:32 -0800 (PST)  
Received: from ccMail by gabriel.maf.org (SMTPLINK V2.10.08)  
id AA820245592; Fri, 29 Dec 95 06:55:43 UTC  
Date: Fri, 29 Dec 95 06:55:43 UTC  
From: FLundgren@daniel.maf.org (Fred Lundgren)  
Message-Id: <9511298202.AA820245592@gabriel.maf.org>  
To: hfsig@tapr.org  
Subject: Radio Mail using PACKETOR/GTOR

This is a request for help on the subject of interfacing TOR mode communications in the 4 to 7Mhz region with Lotus CCMail, which in turn uses telephone modems to communicate over standard telephone lines to our headquarters in Redlands CA.

First by of introduction: My name is Fred Lundgren(N7LSZ, ER0FL, EK9FL). I am a missionary with the Information Technology(IT) branch of Mission Aviation Fellowship(MAF), based in Redlands CA. MAF's primary mission is to provide air service to remote parts of the world. This amounts to flying missionaries, medical supplies and food, etc. to remote parts on the world. An example of this was demonstrated during the latest conflict between Zaire and Rwanda where MAF flew hundreds of hours carrying food, medical personal and other supplies to the refugee camps in Rwanda.

About a year ago MAF decided that in addition to flight services, remote locations of the world also needed communications. Many of the locations where missionaries live and work have no telephones or electricity. In Zaire for example, MAF establish a central post office or HUB in Kinshasa where land lines were available. Using Lotus CCMail as the E-Mail software and VHF packet using standard AX.25 protocol, they were able to link various remote sites around the city to the home office in Redlands CA. The system knows as MAFnet worked both ways with the Kinshasa post office HUB being transparent to the operators at either end.

This system worked quite well locally. However, what happens when we try to connect Nyenkundi 350 miles to the north east to the Kinshasa post office HUB. HF seemed the obvious solution, unless of course we wanted to install several repeaters in between. Unlike VHF/AX.25, the protocol for HF is not so easy. At this point I an embarrassed to say I'm in the dark as to exactly why G-Tor for instance does not interface directly to CCMail the way VHF packet does. Our main techie has spent hundreds of hours writing code to accomplish this interface. His efforts, for the most, part have been successful however, the process is getting very complicated. This is the one thing we try not to do in remote parts on the world where the operators are non-technical. It's hard to believe there is not a commercial product or technology out there that will interface HF packet directly to CCMail without all the fuss in-between. Others have recommended TCP/IP, JNOS, LINUX, duel

port OS/2 etc. however when it comes down to doing it, the flow of information stops.

Therefor, after all that palaver, my question is, and I'm not sure I can even asked it intelligently:

If you were to type out a message on your computer and then sent the message over HF packet radio, which in turn would be interfaced to the telephone at the post office HUB, what HF protocol would you need?

From gc@fox.cen.com Fri Dec 29 09:10:43 1995  
Received: from uu5.psi.com (uu5.psi.com [38.145.226.3]) by sys1.tappr.org (8.7.2/8.7.2) with SMTP id JAA20178 for <hfsig@tappr.org>; Fri, 29 Dec 1995 09:10:37 -0600 (CST)  
Received: from fox.cen.com by uu5.psi.com (5.65b/4.0.071791-PSI/PSINet) via SMTP; id AA06502 for hfsig@tappr.org; Fri, 29 Dec 95 10:10:32 -0500  
Received: by cen.com (4.1/SMI-4.1) id AA03772; Fri, 29 Dec 95 10:10:31 EST  
Date: Fri, 29 Dec 95 10:10:31 EST  
From: gc@fox.cen.com (Gary Chatters)  
Message-Id: <9512291510.AA03772@cen.com>  
To: hfsig@tappr.org  
Subject: Re: [HFSIG:779] More Pentium DSP Benchmarks

>

>I recently received my IAL (Intel Architecture Labs) CDRom, mainly to look  
>at Intel's NSP (native signal processing). For those not familiar with this

IAL does have web pages. The home page is at <http://www.intel.com/ial>.

They publish quarterly CD-ROM and an on-line newsletter. The May 1995 issue discusses the NSP library (at least, they say it does. I get an error when I try to display it, but I can display other issues). It does require Adobe Acroreader.

There is an on-line order form for getting the latest CD-ROM. I have requested a copy; I'll find out later if it is the right one. Maybe it would be easier to just call. :-)  
They have a lot of free stuff and other things they charge for. I tend to think of Intel as "hardware", but they do have some interesting and useful software, too.

73,

Gary

From forrerj@ucs.orst.edu Fri Dec 29 14:42:45 1995  
Received: from ucs.orst.edu (root@ucs.orst.edu [128.193.4.5]) by sys1.tappr.org (8.7.2/8.7.2) with SMTP id OAA29661 for <hfsig@tappr.org>; Fri, 29 Dec 1995 14:42:41 -0600 (CST)  
Received: from p05.t0.monrotel.com by ucs.orst.edu; (5.65v3.2/1.1.8.2/24Sep94-1201PM)

id AA29476; Fri, 29 Dec 1995 12:42:28 -0800  
Message-Id: <9512292042.AA29476@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Fri, 29 Dec 1995 12:46:00 -0800  
To: hfsig@tapr.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: Re: [HFSIG:783] Re: More Pentium DSP Benchmarks

Hi Phil,

>Johan,

>

>This package sounds very interesting. And did I read you correctly that  
>the price is right, i.e., free?

I filled out the form on Intel's Web page and the CDRom arrived a few days  
later by UPS - really excellent customer service. Free!

>

>>256 point Complex FFT        256 uS

>

>This seems too good to be true. Sure it's a P90?

>

These performance figures are presented in a document on the CD in the  
directory NSP20\DOC. It says:

"All results averaged over large repetitions  
of the function call. Data in cache.  
Results represent an upper bound as some timing  
and operating system overhead is included.  
90 MHz Pentium with 256K 2nd level cache under Win NT 3.50"

Of course, paper is patient and perhaps you could pose the question - I get  
the sense that they are keen to please and invite feedback.

>I sweat blood to get my own floating point 256-point CFFT down to 335  
>microseconds on the P90, and that involved doing a radix-4 primitive  
>in assembler that I groveled over for days (rewriting it several  
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>3 clocks per tap once the pipe fills. This is about as fast as I think  
>it's possible to go on the Pentium given its instruction set -- unless  
>there's a really clever trick I haven't discovered yet.

>  
>Phil  
>  
>

The library is rich in functionality for making all sorts of trig conversions: bit reversing and other twiddle factoring issues used in FFT's, Goertzel's algorithm, windowing functions, multirate processing, and LMS. Since you have been playing with similar code, it may be worth looking into.

Good luck,

--Johan

From forrerj@ucs.orst.edu Fri Dec 29 14:42:54 1995  
Received: from ucs.orst.edu (root@ucs.orst.edu [128.193.4.5]) by sys1.tapir.org (8.7.2/8.7.2) with SMTP id OAA29678 for <hfsig@tapir.org>; Fri, 29 Dec 1995 14:42:47 -0600 (CST)  
Received: from p05.t0.monrotel.com by ucs.orst.edu; (5.65v3.2/1.1.8.2/24Sep94-1201PM)  
id AA29494; Fri, 29 Dec 1995 12:42:36 -0800  
Message-Id: <9512292042.AA29494@ucs.orst.edu>  
X-Sender: forrerj@ucs.orst.edu  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Fri, 29 Dec 1995 12:46:07 -0800  
To: hfsig@tapir.org  
From: forrerj@ucs.orst.edu (Johan Forrer)  
Subject: Re: [HFSIG:784] Radio Mail using PACKTOR/GTOR

Dear Fred,

> This is a request for help on the subject of interfacing TOR mode  
> communications in the 4 to 7Mhz region with Lotus CCMail, which in  
> turn uses telephone modems to communicate over standard telephone  
> lines to our headquarters in Redlands CA.

Welcome to HFSIG.

>  
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>  
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> electricity. In Zaire for example, MAF establish a central post  
> office or HUB in Kinshasa where land lines were available. Using  
> Lotus CCMail as the E-Mail software and VHF packet using standard  
> AX.25 protocol, they were able to link various remote sites around the  
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> worked both ways with the Kinshasa post office HUB being transparent  
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>  
> This system worked quite well locally. However, what happens when we  
> try to connect Nyenkundi 350 miles to the north east to the Kinshasa  
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> protocol for HF is not so easy. At this point I am embarrassed to say  
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> sent the message over HF packet radio, which in turn would be  
> interfaced to the telephone at the post office HUB, what HF  
> protocol would you need?  
>  
>

Just my 2 cent's worth.

HF TOR protocols, defines a physical transport level where the TOR protocol logic (AMTOR, PACTOR, GTOR etc.) is typically implemented on dedicated microcontrollers that is part of TNC hardware. This is quite common for example the PK-232's, KAM, etc. It appears there is no standard as far as TNC to host protocol is concerned, i.e., everyone seems to have their own proprietary "host mode" which is your main problem. For VHF networking, "KISS" protocol is pretty much universally adopted as a TNC-host protocol. This means that you will have an easier task in setting up networking client/server systems on VHF. To obtain similar networking implementations on HF with the status quo, you have a problem - they don't handle KISS on HF TOR - the overhead could be rendered it useless.

Now, if you insist on going this route using off-the-shelf HF-capable TNC's, there are two ways to handle the networking interfacing issue - the solution depends on whether you are going to deal with a single

manufacturer's TNC or whether you need to be able to use a number of different manufacturer's TNC's. One solution is to write the necessary driver software on the host to buffer and translate between the networking side and the HF TNC side. The other is to develop a "black box" that has the ability to handle a KISS port on the one end and provide a TNC-specific port on the other. Even a modest microcontroller would be sufficient in the latter situation. Neither solution, however, is trivial and will need careful consideration and probably cost you real money.

You may be interested in the parallel HF modems that have been discussed over the past year on this list. In the present form, the author, Pawel Jolocha (SP9VRC), designed these to use a common KISS interface to the host and thus makes the server side much simpler. These modems use AX.25 for the physical transport layer. This kind of approach probably will get you going really fast in the short term, however, we have yet to discuss in all seriousness, the issue of a protocol for the physical transport layer for HF.

I can think of further solutions - however let see how this goes for starters.

--Johan, KC7WW

From gc@fox.cen.com Fri Dec 29 14:43:40 1995  
Received: from uu5.psi.com (uu5.psi.com [38.145.226.3]) by sys1.tappr.org (8.7.2/8.7.2) with SMTP id OAA29699 for <hfsig@tappr.org>; Fri, 29 Dec 1995 14:43:37 -0600 (CST)  
Received: from fox.cen.com by uu5.psi.com (5.65b/4.0.071791-PSI/PSINet) via SMTP; id AA05116 for hfsig@tappr.org; Fri, 29 Dec 95 15:43:35 -0500  
Received: by cen.com (4.1/SMI-4.1) id AA10064; Fri, 29 Dec 95 15:43:34 EST  
Date: Fri, 29 Dec 95 15:43:34 EST  
From: gc@fox.cen.com (Gary Chatters)  
Message-Id: <9512292043.AA10064@cen.com>  
To: hfsig@tappr.org  
Subject: Re: [HFSIG:785] Re: More Pentium DSP Benchmarks

I wrote:

>  
>IAL does have web pages. The home page is at <http://www.intel.com/ial>.  
>  
>They publish quarterly CD-ROM and an on-line newsletter. The May 1995  
>issue discusses the NSP library (at least, they say it does. I get an  
>error when I try to display it, but I can display other issues).

The problem was an old version of Acrobat Reader. The current version (2.1) works fine with the May 1995 issue. And it does have a couple of articles on NSP.

Gary

From lay@cod.nosc.mil Fri Dec 29 16:58:45 1995  
Received: from trout.nosc.mil (trout.nosc.mil [128.49.16.7]) by sys1.tappr.org (8.7.2/8.7.2) with SMTP id QAA03653 for <hfsig@tappr.org>; Fri, 29 Dec 1995 16:58:42 -0600 (CST)

Received: from marlin.nosc.mil by trout.nosc.mil (4.1/SMI-4.1)  
id AA11734; Fri, 29 Dec 95 14:58:39 PST  
Received: from sam.nosc.mil by marlin.nosc.mil (4.1/SMI-4.1)  
id AA24448; Fri, 29 Dec 95 14:58:53 PST  
Date: Fri, 29 Dec 95 14:58:53 PST  
Message-Id: <9512292258.AA24448@marlin.nosc.mil>  
X-Sender: lay@cod.nosc.mil  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
To: hfsig@tapr.org  
From: lay@cod.nosc.mil (Richard Lay)  
Subject: Nordic HF Conference  
X-Mailer: <Windows Eudora Version 2.0.2>

Hi all!

Has anyone checked out the Nordic HF Conference web pages at  
<http://147.13.228.1/Radio/NordicHF/> ? If so, has anyone successfully  
downloaded, unzipped, and viewed any of the conference papers (they're  
zipped, postscript files)? In particular, "Description of a Laboratory  
Jammer for Automatic HF Systems" by P Nilsson, Proceedings of the Nordic  
Shortwave Conference HF95, 15-17 August 1995. Editor Olov Carlsson.  
Published by the Nordic Radio Society. The first five pages look  
interesting. (That's all I've been able to view. Anyone else have better  
luck?)

Happy Holidays!

Rich

From chbrain@dircon.co.uk Sat Dec 30 04:50:16 1995  
Received: from felix.dircon.co.uk (felix.dircon.co.uk [193.128.224.10]) by  
sys1.tapr.org (8.7.2/8.7.2) with SMTP id EAA28315 for <hfsig@tapr.org>; Sat, 30  
Dec 1995 04:50:12 -0600 (CST)  
Received: by felix.dircon.co.uk id AA00467  
(5.67b/IDA-1.5 for <hfsig@tapr.org>); Sat, 30 Dec 1995 10:50:06 GMT  
Message-Id: <199512301050.AA00467@felix.dircon.co.uk>  
Received: from gw4-187.pool.dircon.co.uk(194.73.168.187) by amnesiac via smap  
(V1.3)  
id sma000448; Sat Dec 30 10:49:49 1995  
X-Sender: chbrain@popmail.dircon.co.uk  
X-Mailer: Windows Eudora Version 1.4.4  
Mime-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"  
Date: Sat, 30 Dec 1995 10:29:00 +0000  
To: hfsig@tapr.org  
From: chbrain@dircon.co.uk (Charles Brain)  
Subject: Re: [HFSIG:789] Nordic HF Conference

>Hi all!

>

>Has anyone checked out the Nordic HF Conference web pages at  
><http://147.13.228.1/Radio/NordicHF/> ? If so, has anyone successfully

>downloaded, unzipped, and viewed any of the conference papers (they're  
>zipped, postscript files)? In particular, "Description of a Laboratory  
>Jammer for Automatic HF Systems" by P Nilsson, Proceedings of the Nordic  
>Shortwave Conference HF95, 15-17 August 1995. Editor Olov Carlsson.  
>Published by the Nordic Radio Society. The first five pages look  
>interesting. (That's all I've been able to view. Anyone else have better  
>luck?)

>

>Happy Holidays!

>

>Rich

>

>

Hello Rich,

No I haven't tried it, but we have a copy of all the proceedings at work as  
the company I work for presented three papers one on H.F link  
management another on managed networks (use of SNMP to control  
large H.F Radio Systems) and also I think a paper on our Digital H.F  
receiver and drive. If you are having trouble try Emailing Hakan Bergzen at  
Hakan.Bergzen@telub.se he watches this news group so he may reply  
directly.

Regards Charles